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COMPUTERWORLD

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The RT PC is very much alive, according to IBM, with a future as a network server and a mid-range Unix platform. Page 8.

Bill Gates takes quill in hand. Microsoft chairman begins three-part series for *Computerworld* on the evolution of computer languages. Page 35.

Multivendor networking appears to be the impetus for Unisys's acquisition of T1 vendor Timeplex. Page 6.

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Honeywell Bull consolidates, trimming its U.S. work force by 14% and transferring mainframe manufacturing operations. Page 10.

Up for grabs again. Computer Corporation of America and its Model 204 DBMS are placed on the auction block. Page 105.

MIS sites drill 9370

System said to validate performance claims

BY ROSEMARY HAMILTON
CW STAFF

Early users of IBM's 9370 mid-range system have found that it lives up to performance claims. However, the ease-of-use factor IBM is pushing seems to elude many users, particularly those migrating from other vendors' systems.

Many 9370 users interviewed by *Computerworld* last week said their systems were up and running in short order. One user likened the installation of his 9370 to that of a personal computer.

While users said they have since experienced minor difficulties moving applications to the system or doing general management, none has reported major problems.

"It's a nice little machine," said Jeff Savit, manager of VM technical support at Merrill Lynch & Co.'s Capital Markets group. Savit's site is testing the 9370 but has made no formal commitment to the minicomput-

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Tracking the 9370

Ten early users of IBM's 9370 are employing their systems in varied manners

Dowling Associates	VM/SP VSE	Host system, development
American Federal Savings and Loan	VM/SP	Host system
Duke Power	VM/IS	Test evaluation
HBO and Co.	VM VSE (guest)	Development
AO Smith Automotive Products	VSE	Host system
Pacific Scientific	VM/IS VSE	Department use
Merrill Lynch Capital Markets	VM/SP	Test evaluation
Rio Grande Sugar Growers	VSE	Host system
Odd Lot Trading	VSE	Host system
Arundel	VSE	Host system

CW CHART

Overhauled 1-2-3 set to bloom next spring

BY DOUGLAS BARNEY
CW STAFF

CAMBRIDGE, Mass. — Lotus Development Corp. will offer the most significant enhancement ever to its 1-2-3 spreadsheet next spring with a version that maintains its traditional look and feel but includes OS/2 and MS-DOS capabilities, a new macro language and multidimensional spreadsheets.

Release 3 of 1-2-3 is scheduled to sell for $495. Users of 1-2-3 Release 1A will be able to upgrade to the new version for $200, and 1-2-3 Release 2 users will be able to upgrade for $150 (see story page 133).

Users contacted last week generally praised the enhancements but said that will not stop them from considering alternatives like Microsoft Corp.'s Excel and Borland International's Quattro.

"Other products have to bring a very substantial increase in value just to be equal with 1-2-3," according to a microcomputer manager who has 2,000 1-2-3 packages installed and who was recently briefed by Lotus.

Another user praised the move to multidimensional spreadsheets. "I can't not push this thing," said Vahe Katros, MIS PC coordinator for Wm. Filene's Sons Co., a Boston-based chain of clothing stores.

Despite the enthusiasm for Release 3, many users still have not determined their next spreadsheet move. "Release 3, Excel and Quattro are forcing us to reexamine our spreadsheet standard," one user said.

Key features of 1-2-3 Release 3 include the following:

- One package for both MS-DOS and OS/2.
- Lotus Extended Application Facility, a new high-level macro language that is available separately.
- An Undo command for correcting a keystroke error, multidimensional spreadsheets and spreadsheet linking.
- Increased performance via built-in intelligent recalculation.
- Built-in macro recording.
- Full-color support within graphs and spreadsheets.

Continued on page 133

IBM code door ajar

BY CHARLES BABCOCK
CW STAFF

IBM is opening the door a crack to software developers that need access to its source code, reversing its often-stated intent to offer only hard-to-decipher object code.

Following a series of meetings during the past month between IBM and officials of ADAPSO, the software trade group, "IBM is going to sit down with several of our members individually in an attempt to figure out their specific needs," Jay N. Goldberg, ADAPSO's outgoing president, said last week. Goldberg made a militant anti-object-code-only speech at the group's September meeting in Colorado Springs.

John Imlay, chairman of Management Science America, Inc. and former ADAPSO president, agreed. "There's a crack in IBM's armor, finally. The issue was nonnegotiable a month ago," he said.

Other ADAPSO members took a more cautious approach. "IBM is making noises. . . . We'll see," said Martin A. Goetz, senior vice-president of Applied Data Research, Inc.

Although IBM first suggested it would restrict customers to

Continued on page 4

Plenty of sizzle, little steak in early OS/2 applications

BY STEPHEN JONES
CW STAFF

Users eager to get out of the blocks early with IBM's first version of OS/2 may find a brick wall blocking their paths when Standard Edition 1.0 ships next month.

Although a slew of software developers have promised applications that will run with OS/2 as early as January, many industry watchers have characterized the programs as little more than "quick and dirty" ports of existing applications.

Analysts concluded that users will be left with software packages that carry an OS/2-compatible label but barely begin to tap the operating system's power and functionality.

In general, initial OS/2 applications will break the 640K-byte memory barrier of DOS and take advantage of its true multitasking capabilities.

But despite the benefits, some analysts warned that superficial claims about OS/2, which was jointly developed by IBM and Microsoft Corp., might create a "buyer beware" market for the next several months. End users looking for more than simple rewrites are likely to be disappointed by what they find.

The three major PC software developers — Lotus Development Corp., Microsoft and Ashton-Tate Corp. — declared last week that they will not ship applications written specifically for OS/2 until at least next October, when Standard Edition 1.1 is

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NEWSPAPER

SECOND CLASS

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Resurrection. Rumors of the RT PC's death are greatly exaggerated, IBM says. The system is playing a large role both as a file server in IBM's distributed networking strategy and as a platform for a more coherent Unix strategy. Page 8.

New Wave. HP defines its application environment with SAA, object management and AI combination, but analysts are skeptical as to HP's success outside of its installed base. Page 6.

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"IBM said they don't know what the demand side of the Token-Ring is because they've never been able to fill it."

THOMAS WHITE
PRESIDENT
INFONETICS, INC.

At an IBM technical briefing for analysts.

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Physical connection is only an early stage on the long journey toward full and logical connectivity.
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DP in heart of Texas

It's easier to sell armadillos than a used computer

BY JEAN S. BOZMAN
CW STAFF

ANGLETON, Texas — What if you held on to your aging computer system just a little too long? Maybe no one would be interested in buying it from you. Maybe nobody would want the spare parts. Maybe no one would agree to haul it away for use as the proverbial boat anchor.

That is what happened in this small Texas town. The Brazoria County data processing department disconnected a 7-year-old Sperry Corp. 9040 minicomputer on Oct. 13. It had been replaced in January by a Hewlett-Packard Co. HP 3000 Series 70, but conversion of the Sperry applications took months to complete.

Once the software conversion was done, MIS director John Dorey opened up bids to cart the Sperry system away. He found few takers. "I called all over the country trying to sell that machine," Dorey said. "Then we tried to sell it for spare parts or for salvage." Bids trickled in, ranging from a low of $10 to a high of $1,600. "There must have been $3,000 to $4,000 worth of gold in that machine," he lamented.

The anger stemmed, in part, from the fact that the Sperry system's purchase had set Brazoria County back some $750,000 in 1980.

Then County Commissioner John Gayle hit on a solution. "He said we ought to sell people chances for $1," his office manager said. "Then we could set the computer on the courthouse lawn and let people take a whack at it with a sledgehammer."

John Dorey *is glad to be parting with his 7-year-old minicomputer.*

Despite the uproar, the story has a happy ending. Dorey is planning to accept a bid that would sell part of the system to salvagers and retain other items for public auction. The conversion to the HP computer, accomplished with a fourth-generation language from Cognos Corp., boosted the number of system users from 19 to 200.

"We finally have enough capacity to get the whole county on-line," Dorey said. Productivity is up. There are 13 applications on-line instead of three. And new projects are in the works, such as development of a new criminal justice data base.

Ungermann-Bass barks back following DCA takeover bid

BY PATRICIA KEEFE
CW STAFF

SANTA CLARA, Calif. — The board of directors for Ungermann-Bass, Inc. has unanimously rejected an acquisition proposal from Digital Communications Associates, Inc. (DCA), promising to pursue any action necessary to prevent a takeover.

In response, DCA issued a statement saying it was disappointed by the rejection but that it "has no present plans for any further action."

DCA tendered an offer to Ungermann-Bass three weeks ago on the heels of the stock market downturn, offering $9.75 in DCA stock for each share of Ungermann-Bass stock.

The board, along with its financial advisers, Goldman, Sachs & Co., last week spurned that offer as "inadequate" and not in the best interest of the firm, its shareholders, suppliers and customers.

Following a 12-hour session, the board unanimously concluded that the firm "can produce the greatest value for shareholders if it continues to pursue its strategic objectives as an independent company," said Ralph Ungermann, chairman, president and chief executive officer.

"We would hope that DCA, which said its proposal was 'friendly,' will now allow us to turn all our attention to serving our customers, growing our business and continuing to improve profitability," Ungermann said.

However, should DCA have other ideas, Ungermann issued a warning. "DCA should be advised that the board also resolved to take such actions as are necessary and appropriate so that the company can maintain that course."

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Unlock the potential.

IBM trims development time

VP Krowe says goal is to cut creation cycle by one year per product

BY CLINTON WILDER
CW STAFF

CAMBRIDGE, Mass. — IBM is making a corporatewide effort to cut its product development cycles by one year, a top IBM executive said last week.

Senior Vice-President Allen J. Krowe told attendees of the annual Seybold Executive Forum here that IBM's goal is to cut the cycles by an average of one year across the product line. "And when we achieve that goal, we'll move the bar again," he said.

Krowe said the Information Systems and Communications Group, which handles IBM's communications products and personal computers, has already cut its product cycles by eight to 10 months. He also noted that the IBM 5363, a follow-on to the System/36, was introduced 10 months sooner than originally planned.

Krowe said much of the faster development speed stems from improved semiconductor quality. IBM chip foundries now have the goal of "one-pass design," designing chips that meet production standards on the first try. In the past, three passes per chip was standard, Krowe said.

In response to a question on IBM's Personal System/2, Krowe said IBM fully expects compatible machines from competitors, but the company also hopes to hold its market share through continued enhancements.

Allen J. Krowe

Not 'clone-proof'

"The PS/2 was never envisioned to be clone-proof," Krowe said. "The openness of the architecture is still there, except for certain aspects like the Micro Channel. There will be clones, but we have a 12- to 18-month lead, and we think we can stay ahead of them."

Krowe said IBM Systems Application' Architecture interface specifications will be available to users this month.

He said the first office applications using those interfaces should appear in early 1988, but they will not be fully integrated across the IBM product line at that time.

In assessing the growth prospects for the computer industry, Krowe predicted an annual growth rate of 6% to 8% in the next five years, mirroring the 7% real growth of the 1970s. By contrast, he said, the industry grew 14% annually between 1980 and 1984 but showed no growth in 1985 and 1986.

Krowe was preceded in the conference lineup by Digital Equipment Corp. President Ken Olsen, who praised the theory behind reduced instruction set computing (RISC). "If I was starting the company from scratch today, I'd use RISC," he said. "But we have found, so far, that it comes up short in the traditional VAX environment. We're looking into it, but right now, it won't make a better VAX."

Olsen: DEC may write Unix System V into Air Force bid

BY JAMES CONNOLLY
CW STAFF

Despite its previous objections, Digital Equipment Corp. will probably bid AT&T Unix System V on its systems when the U.S. Air Force reopens the hotly contested bidding for a multibillion-dollar contract to provide 22,000 office systems, according to DEC Chairman Ken Olsen.

The System V offering would come despite DEC's claims that the Air Force's call for System V compatibility favors AT&T and despite what other DEC officials say are plans to make DEC VMS compatible with the emerging IEEE Posix standard.

In their protest of the Air Force request for proposals, DEC officials maintained that Posix — not the AT&T System V Interface Definition — should have been specified.

Last week, Olsen said DEC will probably bid System V. "We've had 60 people working on it for some time, and we probably will bid System V when the time comes," Olsen said at the Seybold Executive Forum sponsored by Patricia Seybold's Office Computing Group.

But other DEC officials said in recent interviews that they were holding out for the chance to bid VMS rather than System V or DEC's Ultrix version of Unix.

Skip Dalton, system engineering manager with DEC's government systems group, said DEC intends to make VMS compatible with the user and applications interfaces specified under Posix, a standard generally considered to be Unix-oriented.

Dalton said a Posix-compatible version of VMS could be ready to meet the Air Force delivery schedule, with development machines available in 1988 and the bulk of the 22,000 minicomputers shipping between 1989 and 1991. He said Posix compatibility would likely be available to VMS users because of DEC's policy to offer a single version of its operating system.

IBM code

FROM PAGE 1

object code four years ago, it has done so cautiously, eliminating access to source code on new products like VS Cobol II and DB2 but not on its mainstream operating systems. Software writers need source code to develop system utilities, compilers and performance monitors that are compatible with IBM operating systems and subsystems. Source code frequently consists of Cobol, Fortran, PL/I or other third-generation languages that programmers readily understand compared with the 1s and 0s of object code.

Goldberg said ADAPSO needs to see "significant progress" during the next three to four weeks before the board meets in December in Washington, D.C., to determine its final stance on the issue.

ADAPSO indicated earlier that it planned to advocate its stand before the European Economic Community, the U.S. Department of Justice and the Federal Trade Commission.

Goldberg and other software company representatives said they were confident progress would be made, but critics of IBM within ADAPSO said the company had adopted a "divide and conquer" approach to the organization's stand. By satisfying individual companies on spot issues, it will not have to set a policy of keeping its system source code generally available, said spokesmen who asked to remain unidentified.

Changed attitude

Spokesmen for Syllogy Corp., which is currently engaged in talks over source code with IBM, said the tenor of the discussion improved recently. "The first time I asked for source code, [the IBM representative] said IBM policy was to release object code only, not source. But everything was unofficial," said Stan Rintel, Syllogy president. In recent weeks, he said, "the tone has changed. IBM is trying to find a way to accommodate those software developers that have a legitimate need [for source code]."

The IBM-Fujitsu Ltd. arbitration agreement helped change the nature of the discussion, Rintel asserted. Once IBM agreed through the arbitration process to provide source code to an archrival, it was left in the awkward position of refusing source code to what it calls its friends in the independent software industry, he said.

Rintel's firm produces a program that captures changes made to source code and feeds only the alterations into the IBM OS/VS Cobol compiler, reducing the time needed for recompiles. IBM has refused to release the source code for its latest VS Cobol II compiler, but Rintel pointed out that Fujitsu could obtain the source code for it under the arbitration agreement.

'Drive out of business'

"If the Japanese came up with an incremental compiler a year from now for VS Cobol II and we couldn't, they could drive us out of business," Rintel said.

IBM staff members assigned to deal with independent software vendors "have a lot of holes in their arguments" after the Fujitsu agreement, he said.

ADAPSO members cited the following reasons why IBM wanted to implement an object-code-only policy:

- Object code would make it much harder for competitors, particularly Japanese competitors in the operating system arena, to duplicate IBM advances.
- Object code would make it more difficult for IBM users to customize systems at their installations. While offering short-term flexibility, such changes haunted IBM support staff responsible for determining the source of problems but unable to catalogue all the on-site changes.
- Object code would tend to impose on customers a constant eligibility to upgrade. When applications are tailored to customized system code at a site, there is built-in resistance to upgrading because the applications must be converted.

"We don't know if we will get everything our members need," Goldberg said. "But IBM is discussing the issue, and that's a great step forward for us."

COMPUTERWORLD

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Unisys to gain net edge with Timeplex

BY ALAN ALPER
CW STAFF

NEW YORK — Unisys Corp. moved last week to rectify its inability to provide networking for multivendor environments with an agreement to purchase T1 multiplexer vendor Timeplex, Inc. in a stock swap valued at approximately $300 million.

If the acquisition is completed, Timeplex will become the primary entity of a business unit called Unisys Networks. The unit's charge will be to stake out a position in the booming voice and data networking business.

The acquisition will enable Unisys to bolster its proprietary front-end communications processor offerings with the addition of T1 multiplexers, packet switching and network management tools, which are checklist items required to more effectively compete with IBM and Digital Equipment Corp. for large corporate and government contracts.

"This will strengthen our capacity to work within multivendor environments, which is increasingly the case as we expand our business with customers not using our systems," Unisys Chairman W. Michael Blumenthal said during a press conference last week.

The proposed acquisition, already approved by Timeplex's board of directors but subject to shareholder approval, is Unisys's first since it was formed through the merger of Burroughs Corp. and Sperry Corp. last year.

Unisys said it expects to finalize the agreement within three to four months, pending approval of the shareholders and the U.S. government. Unisys offered to exchange one share of its common stock for each share of Timeplex common stock.

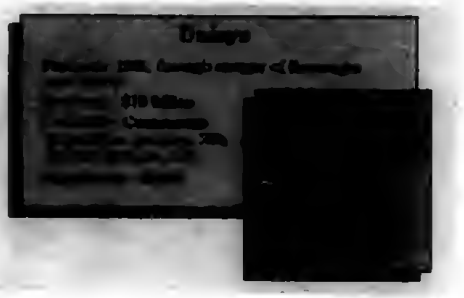
According to industry analysts, Timeplex would provide Unisys with technology to design, install and manage wide-area networks in multivendor environments.

"Unisys is the one computer company that had been left out of the recent emphasis on communications," noted Fritz Ringling, an analyst with Booz, Allen & Hamilton, Inc. "They had no backbone T1 network and offered a proprietary network management system when multivendor networks have become commonplace."

Ringling said Unisys has lacked the capabilities represented by IBM's acquisition of Rolm Corp., its marketing agreement with Network Equipment Technologies, Inc. (NET) and the evolution of its Netview network management system. In addition, DEC offers Decnet while AT&T's claim to fame is in networking expertise.

T1 technology would strengthen Unisys' hand in a number of vertical markets, such as financial services, where customers are creating distributed computing networks. "It will help us in all lines of business," said a Unisys insider who asked not to be identified. "Banking really requires it as do the airlines. Many businesses will need it in time."

At A Glance



CW CHART

Motivation

For Timeplex, the acquisition would provide a broader captive customer base and a partner to help fund research and development in the highly competitive T1 market segment. Observers pointed to a variety of alliances, including NET's relationship with IBM and Digital Communications Associates, Inc.'s acquisition of T1 vendor Cohesive Network Corp. as motivation for Timeplex to find a partner.

Timeplex Chairman Ed Botwinick said the acquisition agreement was an outgrowth of joint development and marketing discussions the two companies have had during the last few months. Timeplex, he said, had sought an alliance with a number of companies after it opted not to allow IBM to remarket its T1 multiplexers.

Timeplex's Botwinick would be president of the new unit which, including Unisys' other communications business, would start with $500 million in revenue. Botwinick would also become a corporate senior vice-president, in charge of spearheading the firm's communications strategies.

HP defines application environment

Structured on Windows, Presentation Manager; plans SAA usability

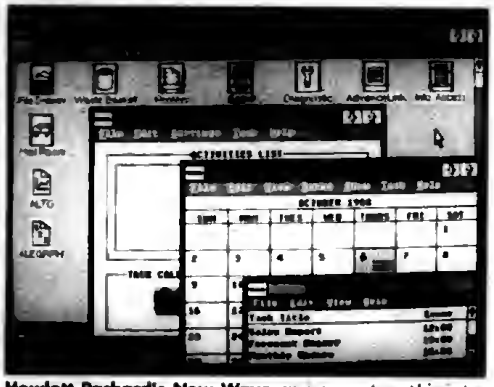
BY JAMES CONNOLLY
CW STAFF

CAMBRIDGE, Mass. — Hewlett-Packard Co. last week defined its own application environment featuring a combination of object-management technology and artificial intelligence. It will provide a user interface built on Microsoft Corp.'s Windows and Presentation Manager, with planned IBM Systems Application Architecture (SAA) compatibility.

HP's New Wave, introduced at a Cambridge, Mass., press conference, was designed to run on Intel Corp. 80286- and 80386-based personal computers and to provide users with a single view of multiple applications on a network of computer resources.

In demonstrating the product, HP officials showed how a sales report could be updated, beginning with the retrieval of a voice message through an electronic mail facility and continuing with the transfer of data from an HP 3000 minicomputer to a spreadsheet and the integration of that data in text and chart form in the report.

HP officials said New Wave should not be viewed as a step into the PC software business but that HP will license the technology to software developers and other vendors.



Hewlett-Packard's New Wave *environment graphic interface uses icons to simplify computer use.*

Analysts were unsure how much success HP might have in marketing the technology outside of its user base, particularly with IBM and Digital Equipment Corp. offering their own application interfaces.

'Down to the desktop'

"They are bringing integration tools down to the desktop. That is the same thing IBM is trying to do with SAA and DEC is doing with its windowing interface," said Iris Polaski, a senior industry analyst at San Jose, Calif.-based market research firm Dataquest, Inc. She said, however, that New Wave will differentiate HP offerings when the company pairs its desktop systems and its minicomputers.

Senior analyst Michael Millikin of Patricia Seybold's Office Computing Group in Boston compared HP's strategy with Sun Microsystems, Inc.'s promotion of its Network File System as a networking standard. He noted that few competitors are likely to develop competing products because of the time involved in producing a New Wave type of system, which took four years in HP's case.

New Wave will be available to developers in February. A runtime version and New Wave-based applications are scheduled to be available during the second half of 1988.

A spokesman said HP intends for New Wave to work within IBM's SAA structure, "whatever that ends up being." He said Microsoft MS-DOS applications can run with New Wave in various ways, with much of the work already being done to bring applications under Windows.

Two key elements of New Wave are an object-management facility and artificial intelligence-based agents that act as software robots in automating tasks involving multiple applications.

The object-management facility is intended to help users move across applications and create compound documents with varied types of data, such as spreadsheets, text, graphics, voice and scanned images. The objects can be moved around with the Windows icon and mouse technology.

Users can integrate data from character-oriented applications, such as HP's Information Access bridge to HP 3000 minicomputers and Lotus Development Corp.'s 1-2-3, into the object-management facility, according to HP officials.

A spokesman said 1-2-3 might be integrated in various ways, starting with its being listed under an icon for MS-DOS with other non-New Wave applications and being called off a menu to take over the full screen. He said a second integration level might let a user create an icon and windows for 1-2-3 but would not support New Wave features such as Help or computer-based training facilities. At the highest level of integration, an application such as 1-2-3 could be fully encapsulated with all New Wave features, the spokesman said.

The object-management facility was designed to automatically update related files in different applications and to allow users to pull objects such as spreadsheet cells and pie charts from a menu and arrange them on a page by moving icons.

Path tracking

The agents in New Wave track a user's path through the various applications and interpret the user's intentions, Millikin said. He said developers might be able to write applications that allow agents to sort a user's E-mail and prioritize incoming messages.

Robert J. Frankenburg, general manager of HP's information systems group, said New Wave is compatible with MS-DOS and Windows 2.0 and will be made compatible with Microsoft's OS/2 and Presentation Manager.

In demonstrating New Wave, HP officials used it with Microsoft's Excel software on an HP Vectra personal computer.

The New Wave Developer Kit costs $895. A runtime version for users costs $195.

Early OS/2

FROM PAGE 1

delivered with the graphics-based Presentation Manager.

"The really innovative applications won't come out until Presentation Manager ships," said Steve Ballmer, Microsoft vice-president of systems software.

Top vendors have balked at writing new applications for the bare-bones Standard Edition 1.0 because it does not take advantage of the Presentation Manager's graphics capabilities.

"I don't consider a product to be designed as an OS/2 application unless it runs under Presentation Manager," said Edward Esber, chairman and chief executive officer of Ashton-Tate. "The real design platform for OS/2 is going to be Presentation Manager."

Version 3 of Lotus's 1-2-3, which will ship in the second quarter of next year, will use OS/2's memory and multitasking features but will not be designed specifically for OS/2. Lotus's first OS/2-specific application will be 1-2-3/G, which the company has promised will ship shortly after the release of Presentation Manager.

"If you're looking at longer term products, I don't think you're buying yourself anything important with these early applications," said Sunil Subbakrishna, a manager with the tax computer services group at Arthur Andersen & Co. in Chicago. "We want to move over to OS/2 because there are fairly compelling business reasons, not just because it's a new technology."

Jim Hansel, vice-president of Chase Investors Management Corp., was just as reluctant. "I doubt it would be worth the effort to do a wholesale changeover to OS/2 at this point," he said.

No advantages

"Generally, I don't think it offers you any advantages to be in OS/2 at this point — the applications offer no real improvement on the front end," said Robert Therrien, an analyst with Paine Webber, Inc. in New York.

While software houses said they will not release true OS/2 applications until a graphics-based operating system is available, Ashton-Tate and others are expected to ship some simple ports of their own.

"Virtually every major DOS package is either already ported over to OS/2 or will be very soon," said Bill Higgs, director of software research at Cupertino, Calif.-based Infocorp.

Higgs said developers will be compelled to offer applications that run with the initial version of OS/2 for the sake of saying they are competing in that market. The real turf battles, be added, will take place with fresh software released on the heels of the Presentation Manager.

TOP VENDORS have balked at writing new applications for the bare-bones OS/2 Standard Edition 1.0.

Others are more intent on cracking the initial OS/2 market. Software houses such as Borland International, Computer Associates International, Inc., Oracle Corp. and Micropro International Corp. are attempting to gain an early foothold with basic ports of their existing programs. But each of the firms conceded that true OS/2 functionality will not be attained without a graphics-based backbone.

Borland is betting that its Paradox OS/2 relational data base will win over customers who want to run multiple applications simultaneously with increased speed now instead of next year.

The biggest advantages of running applications under OS/2 instead of DOS are its multitasking features, its ability to exchange information between applications and the fact that it helps applications break the 640K-byte memory barrier.

Analysts predicted that most users will not begin to make the big leap from DOS to OS/2 until the graphics-based package is available next October.

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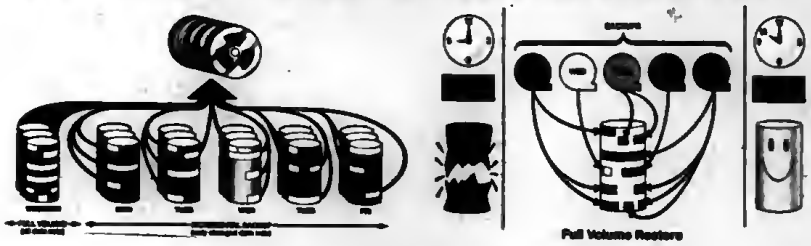

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RT PC signed on for server, Unix role

BY ED SCANNELL
CW STAFF

BOSTON — IBM's much-maligned RT Personal Computer will be used both as a file server in its distributed networking strategy and as an important platform for a more coherent Unix strategy, IBM officials told *Computerworld* last week.

Combating the perception that the RT PC is dead in the water, IBM said the system remains strategically vital. "The RT is playing a larger role than people think," an IBM spokesman said.

When IBM introduced the RT PC in January 1986, it was positioned as a stand-alone, special-purpose machine.

The company now portrays the system as a general-purpose machine targeted at non-IBM accounts in which users can port over their Unix-compatible applications.

IBM decided to change the RT PC's marketing strategy earlier this year when the firm found that many customers were finding uses for the machine outside the technical markets.

"What has evolved over the last six months is the announcement of AIX on the Model 80, more customers finding commercial uses for AIX and a concerted effort on our part to participate in multiuser Unix opportunities," the IBM spokesman said.

Analysts have placed the number of RTs sold at between 10,000 and 15,000.

Changing vision

IBM said that so far, the RT has been sold to the commercial, scientific and academic markets. "When we brought out the RT, we had a vision that it would be used in the technical professions, and we have sold a lot of machines to those people," said Frank King, vice-president of IBM's Entry Systems Division. "But we have also sold a lot of machines to the commercial sector."

In what appears to be the beginning of a more unified Unix strategy, IBM said the Personal System/2 Model 80 will serve as an entry-level system for AIX-compatible applications and that the RT will be a mid-range platform acting as a gateway to host systems such as 9370, 4300 and System/30, 34 and 36 series of minicomputers. At the high end, the company has already stated it intends to develop versions of AIX for its mainframes.

"Generally, we'll lead with a 3X or 9370 solution because frequently, customers that we have a strong relationship with have an active program in those areas," the IBM spokesman said. "But where a customer has a need for a Unix-based solution, [the RT] can be another solution. We aren't going to ignore the fact that a lot of our customers are using Unix-based systems."

IBM is also increasingly positioning the RT in a gateway role on networks. "An RT can be a host communicating out through the Token-Ring or Ethernet to another RT which serves as a gateway up to the 9370," the apokesman said.

The RT is capable of handling four local-area networks (LAN) simultaneously — two IBM Token-Ring and two Ethernet networks. The company has built a bridge consisting of several protocols, most notably Technical Control Protocol/Internet Protocol, that allows applications to go back and forth between the two networks.

With four LANs attached, the RT can support up to 32 users. However, the amount of users it can support at one time depends on the amount of traffic there is on the system at any time.

"You can pass a Token Ether way," the spokesman quipped.

No end to gap

While some said there is little difference in performance between an RT and a PS/2 Model 80 and implied that the RT's future looks dim, IBM clearly intends to keep a significant performance gap between the two.

"There will continue to be a delta between the two in terms of performance," the spokesman said.

He also noted that the RT can execute 4.5 million instructions per second and that IBM intends to eventually dramatically increase that speed.

The company also noted that by attaching a small computer systems interface adapter to the system, it is capable of handling up to 5.6G bytes on 9332 disk drives, which are used throughout IBM's mid-range family.

"So the RT can be used as a server or data base," the spokesman said.

Further evidence of the RT's potential power is the Virtual Resource Manager (VRM), which is part of AIX. The VRM, which is not folded into the kernal of AIX, can address up to 1 terabyte, or 1,000G bytes, of virtual memory.

While IBM intends to strengthen the RT's power and position in its overall strategy, the company said it will not necessarily diminish the importance of the role its System/34, 36 and 38 machines will play. Corporate customers will choose between the RT and the System/34, 36, and 38 based on application needs.

9370 sites

FROM PAGE 1

er, he said. "With us being so compute-intensive, it's not easy to tell how we will use it. But there are ways we could use it."

Many shops that were contacted are currently running such programs as IBM's Professional Office System and SQL/DS and Information Builders, Inc.'s Focus. Most sites have a number of homegrown applications that were easily transported to the new host, users reported.

And despite IBM's positioning of VM as the primary operating system for the new hardware, many users are running the VSE operating system. Of the 10 users interviewed last week, seven are running VSE, although some of them are also running VM.

More than expected

Initial performance evaluations show that the 9370 has gone beyond some users' expectations.

At the motor controls division of Anaheim, Calif.-based Pacific Scientific Co., MIS Director Edward Wolf was accustomed to operating as a remote site that often had to play a waiting game with headquarters to get data processed. His recently installed 9370 Model 60 is processing 22,000 transactions per day, with a standard response time of less than two seconds. "Everything used to be at corporate, so our response time now is excellent," Wolf said.

Merrill Lynch's Savit performed a Dhrystone benchmark and a floating-point performance test on his firm's 9370 Model 60 to determine how it stacked up against an Amdahl Corp. 5880. Savit's results showed that the 9370 had about one-tenth the performance of the Amdahl in the Dhrystone test and one-fifth its performance in the floating-point test. Savit cautioned that the results were a "very rough rule of thumb." In terms of millions of instructions per second ratings, the Amdahl machine has approximately 10 times the power of the 9370.

Although the 9370 has been billed as a departmental computer, most of the early users interviewed purchased the 9370 to serve as their host system, replacing either an IBM 4300 series mainframe or another vendor's hardware. Only two user sites in this group, Merrill Lynch Capital Markets and Duke Power Co., are evaluating the 9370 for use as a departmental system.

Overall, users said they moved to a production mode on the 9370 with relative ease. But users moving from other vendors' hardware said there has been an adjustment to the IBM environment that they were not expecting.

At the headquarters of Odd Lot Trading Co., a retail store chain, the MIS department is rewriting applications that had run on a Wang Laboratories, Inc. VS 60. So far, three homegrown applications have been ported since September. They have been running on the 9370 with no problems, according to Stewart Bacheler, director of MIS.

Bacheler also said he found that day-to-day management of the 9370 was not what he expected. "Just because the box is small doesn't mean it's easy," he said. "I'm surprised at how much more difficult it is than I thought it would be. It's just a more operator-intensive system than the Wang."

Took some effort

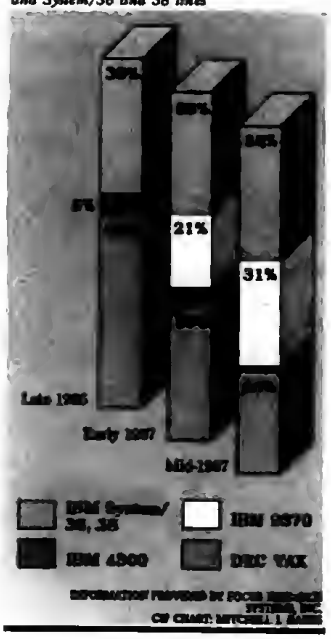
Another user just entering the IBM world said his staff faced a significant learning curve but adapted well once the 9370 was running. John Kerber, vice-president of information services at American Federal Savings & Loan in Des Moines, Iowa, said the move from a Datapoint Corp. proprietary banking system to the 9370 took some effort. "I had to force-feed it to some of the staff," Kerber commented.

Other users, who came from an IBM environment, found the transition easier. "Things have gone without a hitch so far," said Joseph Speargas, administrative services manager at Arundel Corp. in Baltimore. Arundel recently replaced an IBM 4331 with a 9370 Model 60. The company selected the 9370 over IBM's 4381 because maintenance costs were lower, according to Speargas.

AO Smith Automotive Products Co. in Milan, Tenn., replaced an IBM 8100 running IBM's DPPX operating system with a 9370 Model 60 in September. According to DP Manager Ann Blankinship, the system was in production mode within a week after delivery.

On the move

Quarterly surveys indicate the 9370 is playing an increased role in future MIS departmental systems plans — at the expense of the 4300 and System/36 and 38 lines



AT&T revises channel specs

BASKING RIDGE, N.J. — AT&T said last week it plans to revise specifications for Dataphone Digital Service (DDS) so the service can support a clear 64K bit/sec. channel.

The service is a transitional step to an AT&T service that provides 64K bit/sec. transmission compatible with the Integrated Services Digital Network (ISDN) standard, according to Thomas Nolles, president of Haddonfield, N.J., consulting firm CIMI Corp.

"The only difference between 64K bit/sec. DDS and 64K ISDN is the way that the calls are set up. To the user, there is no difference at all," Nolles said.

AT&T is in the process of converting its 1.5M bit/sec. T1 backbone network to handle 64K bit/sec. channels "and probably decided it might as well give clear 64K bit/sec. to users in recognition of an overall evolution of data channels" to that bandwidth, Nolles said.

The service will be offered in conjunction with an existing AT&T offering, DDS with secondary channel, that allows users to send diagnostics and other network information on a separate channel over the DDS network, leaving all 64K bit/sec. of the bandwidth for voice and data transmissions, according to the company.

AT&T announced DDS with secondary channel support several months ago.

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Honeywell Bull boils down staff; 1,600 jobs lost

BY GLINTON WILDER
CW STAFF

MINNEAPOLIS — Honeywell Bull, Inc. announced last week a major reorganization of its U.S. operations, consolidating the manufacture of its mainframes and minicomputers and cutting its U.S. work force by 14%.

The former Honeywell, Inc. computer business will eliminate 1,600 of its 11,500 jobs in the U.S., 1,000 of them in manufacturing positions. A spokesman said the company hopes to trim 350 to 400 positions through early retirement incentives and an unspecified number through attrition but will also utilize layoffs to make cuts within the next year.

Honeywell Bull will move production of its new DPS 8000 mainframes from Phoenix to Lawrence, Mass., where it currently builds the DPS 6 Plus minicomputer series. The Phoenix facility will cease systems manufacturing as demand for the older DPS 8 mainframes winds down, according to Jerome J. Meyer, Honeywell Bull's president and chief executive officer. The Phoenix operation will eliminate 800 of its 3,100 jobs.

Meyer said last week's announcement was the culmination of goals outlined when Honeywell and its joint venture partners, Groupe Bull and NEC Corp., formed Honeywell Bull earlier this year. "We didn't do anything that should surprise anyone who listened to us back in March," he said. "We said we would rationalize our product line, get rid of excess capacity and get rid of layers of bureaucracy."

Increased efficiency

Meyer said the actions are an effort to increase operating efficiency rather than a response to slowing business. He said the U.S. operation is profitable for the year, with revenue growth of 10%, noting that high-end DPS 90 sales are up 50% from 1986, and sales of the DPS 6 line are up 15%.

"The rationale for getting rid of excess capacity is pretty obvious," he said. "We certainly have a capacity problem. We have 1,000 excess manufacturing jobs, and we will also eliminate staff functions that, frankly, I don't think we need."

Five hundred jobs will be cut from Honeywell Bull's Massachusetts work force of 4,700. Concurrent with those cuts, the company will consolidate some of its 15 offices into a new facility adjacent to its current offices in Billerica, Mass.

The firm has not yet determined which Massachusetts facilities will close, a spokesman said. A wide variety of corporate functions are based in the state, including small systems and DPS 7000 marketing, customer service, human resources, sales support and some software development.

During the employee reductions, Honeywell Bull will add about 120 jobs, mostly in mainframe and communications development work in the Phoenix area.

Meyer said the actions announced last week are not directly related to the U.S. operation's new relationship with its French and Japanese partners. "Even if the [joint venture] papers were never signed, we would have done something very similar," he said. "We are not moving any more production offshore."

In a separate, related announcement, Honeywell Bull reorganized its U.S. marketing effort into six divisions under Executive Vice-President John C. Butler.

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IBM powers up System/88 line

RYE BROOK, N.Y. — IBM matched the moves of its supplier, Stratus Computer, Inc., with the introduction last week of two high-end models of the IBM System/88 fault-tolerant processor.

After Stratus unveiled its XA 2000 Model 150 and Model 160 with five and six processor sets [CW, Nov. 9], respectively, IBM immediately followed with the debut of the System/88 Model 85 and Model 86.

IBM also set up a graduated pricing schedule for System/88 programs, with software for low-end models priced at one-third to one-half the cost of the same software on high-end models.

The Stratus and IBM lines both feature a new operating system version, known as the Stratus VOS Release 6.0 and as the IBM System/88 Operating System. The new versions support one-third more memory than earlier versions. The new processors are available with up to 96M bytes of memory.

IBM said it is aiming the System/88 at fault-tolerant applications in the financial, retail, manufacturing and communications industries. The company added more than 200 enhancements to the Stratus processors before reselling them as the System/88 line, according to an IBM spokeswoman. She said two key additions are the IBM Host Command Facility extension to IBM's Systems Network Architecture and support for various IBM devices, such as 4975 and 5262 printers.

The System/88 Model 85 costs $417,000, and the Model 86 costs $492,000. IBM said they will be available during the second quarter of 1988.

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Tool lets Mac tap into Apollo net

Communications link turns Domain workstation into file server

BY ELISABETH HORWITT
CW STAFF

CHELMSFORD, Mass. — Apple Macintosh users will be able to directly access files and resources on an Apollo Domain network through a communications link expected to be announced tomorrow.

Apollo Computer, Inc. is expected to announce an agreement with Calabasas, Calif., software developer Information Presentation Technologies, Inc. (IPT) to jointly market a package developed by IPT.

The software turns an Apollo Domain workstation into a server for Apple Computer, Inc. Macintoshes on an Appletalk network, according to an Apollo spokesman. The server software is "the first commercial implementation of Apple file protocols in a Unix workstation environment," the spokesman claimed.

Transparent access

The server is said to provide Macintoshes with the ability to transparently access resources on a Domain network of Apollo workstations. The network can be either Apollo's proprietary token-ring or Ethernet, according to Apollo.

Macintoshes reportedly can exchange files with Apollo workstations using the vendor's Distributed File System protocols or can access applications in terminal mode.

Apollo already offers a similar link between Domain and IBM Personal Computers. "Now you can have Macintoshes, PCs and Apollos sharing electronic mail," the spokesman said.

The software "takes Macintoshes into the Domain environment with full access to its file system and different programs running off it," said David Marshak, an analyst at Patricia Seybold's Office Computing Group, a Boston-based consulting firm. Marshak said he saw a prototype of the product demonstrated at a recent Unix conference.

Companies with Macintosh installations can better leverage their investments by making use of special Domain network features and can off-load processing to Apollo workstations, Marshak added.

The package is Apollo's riposte to TOPS, a product from Sun Microsystems, Inc.'s TOPS subsidiary, formerly known as Centram Systems West, Inc.

The product provides a server-based link between Macintoshes on Appletalk and a network of Sun systems, according to David Terrie, president of Newport Consulting in Scituate, Mass. "Apollo has been driven to match Sun in providing strong open connectivity," Terrie said.

Counterpoint, Multitech join

SAN JOSE, Calif. — Counterpoint Computers, Inc. last week completed a merger with Multitech Industrial Corp., a member company of the MSC Group, a Taiwanese conglomerate.

Under the agreement, Counterpoint will become a wholly owned subsidiary of Multitech, headed by Counterpoint founder and President Pauline Alker. Headquarters for the subsidiary will remain here, and Counterpoint's 60-member work force is expected to remain intact.

The transaction included an undisclosed amount of stock and cash, officials said.

Alker said the merger provides Counterpoint "the critical mass" to become a leading player in the Unix-based systems market. MSC boasted sales of about $200 million last year. Founded in 1984, privately held Counterpoint has sought alliances with other computer companies in order to obtain financing. Among its investors are AT&T and Kyocera Corp.

Board makers staking out Mac turf

BY JAMES A. MARTIN
CW STAFF

Several third-party IBM enhancement board makers are preparing to branch out into the Apple Computer, Inc. Macintosh environment.

Orchid Technology, Inc. in Fremont, Calif., plans to release its first Macintosh add-in board in the second quarter of 1988, for example. While not divulging details, an Orchid official said the six slots on the Macintosh II provide Orchid with many additional board opportunities. The first Orchid boards for the Mac II and the Mac SE will be consistent with Orchid's focus on accelerators, graphics and multifunction, Orchid Vice-President of Marketing Craig T. Lynar said.

Quadram Corp. expects to show its first Macintosh boards at Comdex/Spring '88 in Atlanta, according to President Bob Brown. Brown said Quadram is most interested in graphics enhancements for the Mac II, but he would not elaborate on specific product plans.

The Macintosh market is an easy transition for an IBM add-on board vendor today, Brown said, because more dealers are selling both IBM and Apple products. "We don't need to create a whole new customer base to sell in both markets," he added.

Cumulus Corp. in Cleveland will release an add-in board for the Macintosh later next year, according to Cumulus President Martin Alpert. Alpert would not give details but said there are "significant opportunities in graphics and memory," especially for the Mac II, which has six expansion slots compared with the SE's one.

Gray area

Despite growing corporate interest in the Mac, the business of selling enhancement boards for the Macintosh environment has its uncertainties. AST Research, Inc., for example, is considered the leader in Mac add-on boards, but most observers and analysts said AST's Mac board sales have been below expectations.

DESPITE GROWING interest, the business of selling enhancement boards for the Mac environment has its uncertainties.

On Oct. 1, AST consolidated its Apple board division with its Enhancement Products Group, which is responsible for IBM Personal Computer and Personal System/2 boards. The move caused further speculation that the Apple market had not been profitable for AST.

However, a company spokesman said the consolidation was a result of an overall corporate reorganization to cut operating costs. "Our Apple board sales have actually exceeded our expectations, and the move has more to do with AST's attempts to streamline operations," said Mark Lebar, marketing manager for AST's Apple boards.

"The PS/2 line has much better long-term prospects for add-in companies," Cumulus's Alpert said. "The PS/2s are going to need communications with modems, storage backup, more memory, add-on floppy disk drives and so forth — all of which will be a bigger market, dollar-wise, than what you had in the PC or Apple line."

Cumulus is a start-up company, and it "had the choice to release products for the PS/2 or the Apple. We chose the PS/2 because there are more long-term opportunities there," Alpert said.

Still, the Macintosh market is growing, and Alpert said the Mac has "always been an interesting machine for me."

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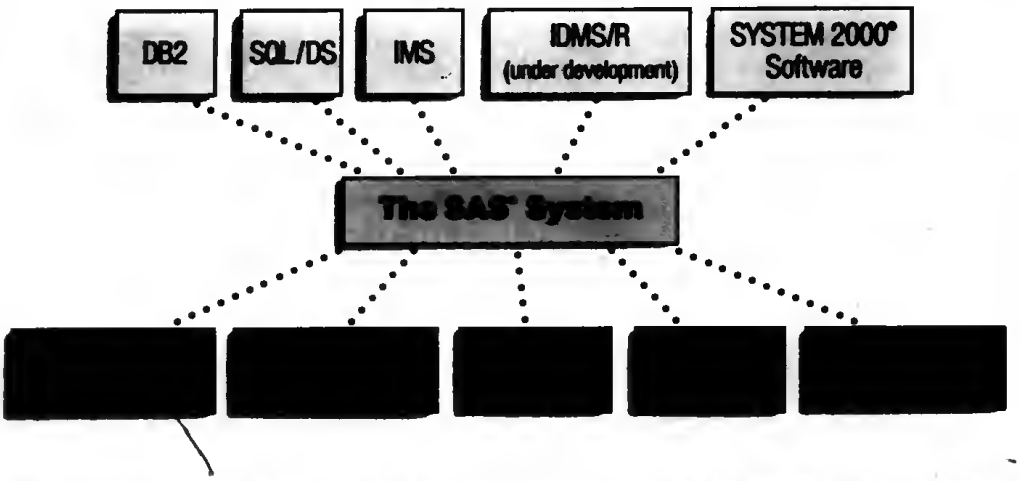

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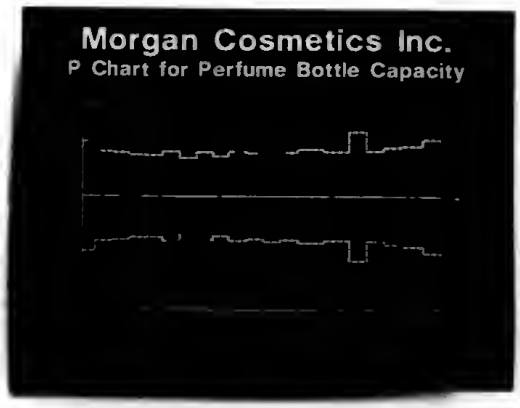

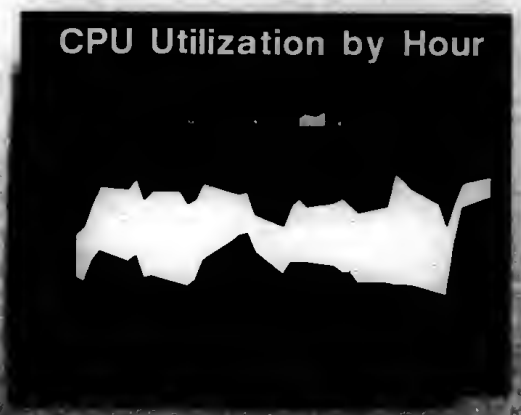

High-powered workstations top manufacturing show

DETROIT — High-performance workstations topped the array of product introductions at Autofact '87 here last week, where an estimated 25,000 people showed up to learn about the latest manufacturing automation systems and strategies.

At the 10th annual conference, sponsored by the Society of Manufacturing Engineers (SME) and the Computer and Automated Systems Association of SME, announcements included the following:

- Two graphics workstations from Silicon Graphics, Inc. in Mountain View, Calif. The Iris 4D/60 GT and Iris 4D/70 GT are reportedly capable of handling 100 million floating point operations per second. The systems, designed to move three-dimensional drawings in real time, are priced at $74,900 and $89,900, respectively. First shipments are expected in March.
- Convex Computer Corp. in Richardson, Texas, announced a 1G-byte disk drive compatible with the firm's C1 XL and C1 XP small supercomputers. Customers can add up to four of the high-density disk drives to a four-processor XP system, giving users access to 4G bytes of storage within the system's cabinets. A single unit is priced at $30,000.
- Intergraph Corp. in Huntsville, Ala., announced a new generation of its Clipper series of 32-bit workstations that the company claimed run at a rate of 13 million instructions per second. The new Clipper Model C 300, which runs at clock rates of up to 50 MHz, reportedly will oot ship in volume until late 1988. No price was given for the new product.
- Apollo Computer, Inc. in Chelmsford, Mass., introduced an industrial version of its Series 3000 workstation. The new DN3040 Ruggedized Workstation can run both 32-bit Apollo Domain applications and Microsoft Corp. MS-DOS microcomputer applications. A base model costs $11,900.
- MSA Advanced Manufacturing, Inc. said the recently announced joint development agreement with Tandem Computers, Inc. will result in prototype modules of its Factory Control and Management System, scheduled for delivery in the late summer of 1988.

The company said it is planning general availability at the end of the fourth quarter of 1988 for the first four modules: Data Control Manager, Inventory Control Manager, Manufacturing Methods Management and Materials Tracking and Control. By the end of 1989, the firm said it hopes to deliver the remaining modules: Labor Collection and Analysis, Total Quality Management, Maintenance Planning and Tracking and Production Scheduling and Optimization.

- Control Data Corp. in Minneapolis announced it will be reselling three crash-analysis packages developed at the Lawrence Livermore National Laboratories in Livermore, Calif. The software is intended for use by automobile companies assessing car safety.

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GM picks CAD/CAM partners

BY JEAN S. BOZMAN
CW STAFF

DETROIT — General Motors Corp. selected two strategic partners last week with which it will standardize its computer-aided design and manufacturing (CAD/CAM) and computer-aided engineering applications throughout the world's largest automotive enterprise.

Although not formally announced, the decision was the topic of conversation at Autofact '87 here, at which most of the 20 firms considered in GM's two-year evaluation were exhibiting.

Cadam, Inc., a Burbank, Calif., subsidiary of Lockheed Corp., and McDonnell Douglas Corp. identified themselves as winners of the selection process. The partnership designation of Cadam and McDonnell Douglas was confirmed in a Nov. 9 letter from GM, but GM declined to make a formal announcement of the selection.

According to Cadam and McDonnell Douglas, the companies will work with GM's Electronic Data Systems Corp. (EDS) subsidiary in its "C-3 project" to develop custom applications based on their existing products. Software will be required to run on platforms that meet GM's standards, which reportedly are already supported by workstations from Sun Microsystems, Inc., Apollo Computer, Inc. and Hewlett-Packard Co.

Expanding platforms

Cadam representatives said the announcement will likely result in the company porting its Cadam products to platforms it does not currently support. "GM has chosen a number of hardware platforms for CIM," a Cadam spokeswoman said, referring to computer-integrated manufacturing. "What this does is ensure that Cadam will run on all those platforms."

Cadam products are currently sold only on IBM computers. David J. Brazier, director of marketing for Cadam, said the company's wire-frame and solid-modeling software products were previously available only on IBM's RT Personal Computer, 5080 and Personal System/2 series.

McDonnell Douglas's Information Systems Group will work with EDS to develop customized CAD/CAM products, according to a McDonnell Douglas representative who asked not to be named.

Cadam and McDonnell Douglas were selected from a field of five finalists, according to a Cadam spokeswoman. GM had been searching for one year and considered 20 vendors as strategic partners in CIM. Among the finalists were Computervision Corp., IBM and Intergraph Corp.

"We didn't make an announcement because we didn't want to create a big splash," said Tony Affuso, division manager of technology and strategy for GM's Technical Systems Development Group.

For the next three years, GM and the two strategic partners will develop standard CAD/CAM applications, as well as a set of specifications required of any future GM CAD/CAM software purchases. The standards are to complement an older standard that was developed within GM during the last 20 years and called the Corporate Graphic System. After three years, GM's new standards are set to be published. In five years, the process is scheduled to be opened to other strategic partners, Affuso said.

Vendors debate movable 3-D models

Value of systems raises questions; are they just 'flash and sizzle'?

BY JEAN S. BOZMAN
CW STAFF

DETROIT — Spinning, flipping and rotating, three-dimensional CAD/CAM drawings were the stars of this year's Autofact '87 show, held here last week.

The 3-D computer-aided design and manufacturing, or CAD/CAM, representations of cars, planes and auto parts were, indeed, show-stoppers. But on the Autofact floor, vendors argued about the importance of moving the shapes in real-time — and about how much movement engineers really want.

Silicon Graphics, Inc. in Mountain View, Calif., took an extreme position in the argument. "If it doesn't move, it isn't 3-D," Silicon Graphics President Edward McCracken said at a Tuesday press conference introducing two graphics workstations.

The company's 4D/60 and 4D/70 GT models are capable of manipulating 3-D color graphics in real-time through the use of a mouse-driven program. Dominant in the field of video animation, Silicon Graphics wants to grow its market share in computer-integrated manufacturing (CIM) applications.

"We are the only company devoted only to 3-D systems," McCracken claimed. "You'll see a lot of 2-D vendors out there on the floor claiming you can upgrade to 3-D, but we don't believe you can."

But for all its advantages, 3-D has just as many headaches. That is because 3-D files require twice as much file space to store, 100 times the arithmetic processing power of two-dimensional manipulation and up to 1,000 times the number of graphics calculations, according to Silicon Graphics statistics. In the case of Silicon Graphics, multiple reduced instruction set computing chips share the work of calculating vector movement.

Other vendors agreed with the aim of 3-D modeling, but disagreed with McCracken's analysis.

"Being able to manipulate 3-D images at high speed in real-time will become a powerful tool over time," said David Brazier, director of marketing for Cadam, Inc. "But, for now, it's really a lot of flash and sizzle. Does an engineer really need a model to spin in 3-D? Probably not. We can do the job and create 3-D images. But we focus on being able to describe the objects accurately for engineers."

The chief limitation for many 3-D packages, Brazier said, is the speed of the underlying hardware engine. Cadam runs on standard IBM hardware, such as the IBM RT PC, 5080 and Personal System/2. "If IBM has a system like Silicon Graphics, we could move our images as quickly as Silicon Graphics does," Brazier said.

Powerful graphics applications such as 3-D modeling use up far more memory than other applications. For this reason, vendors say they must provide large amounts of memory to go with such systems.

At Autofact, Richardson, Texas-based Convex Computer Corp. introduced a $30,000 high-density disk drive with 1G byte of storage capacity for use with its C1 minisupercomputers. "The key to being able to do these complex simulations is large memory," said William A. Hogan, industry marketing director at Convex. "For the first time, we can simulate an entire jumbo jet or the crash of a car model with all the data points in its design," he added.

Still, a crash simulation that takes just seconds to replay on a display terminal takes 10 to 40 hours of compute time on a supercomputer. Manipulation of data can be done in real-time, Hogan said, but the generation of complete data files describing the entire object cannot.

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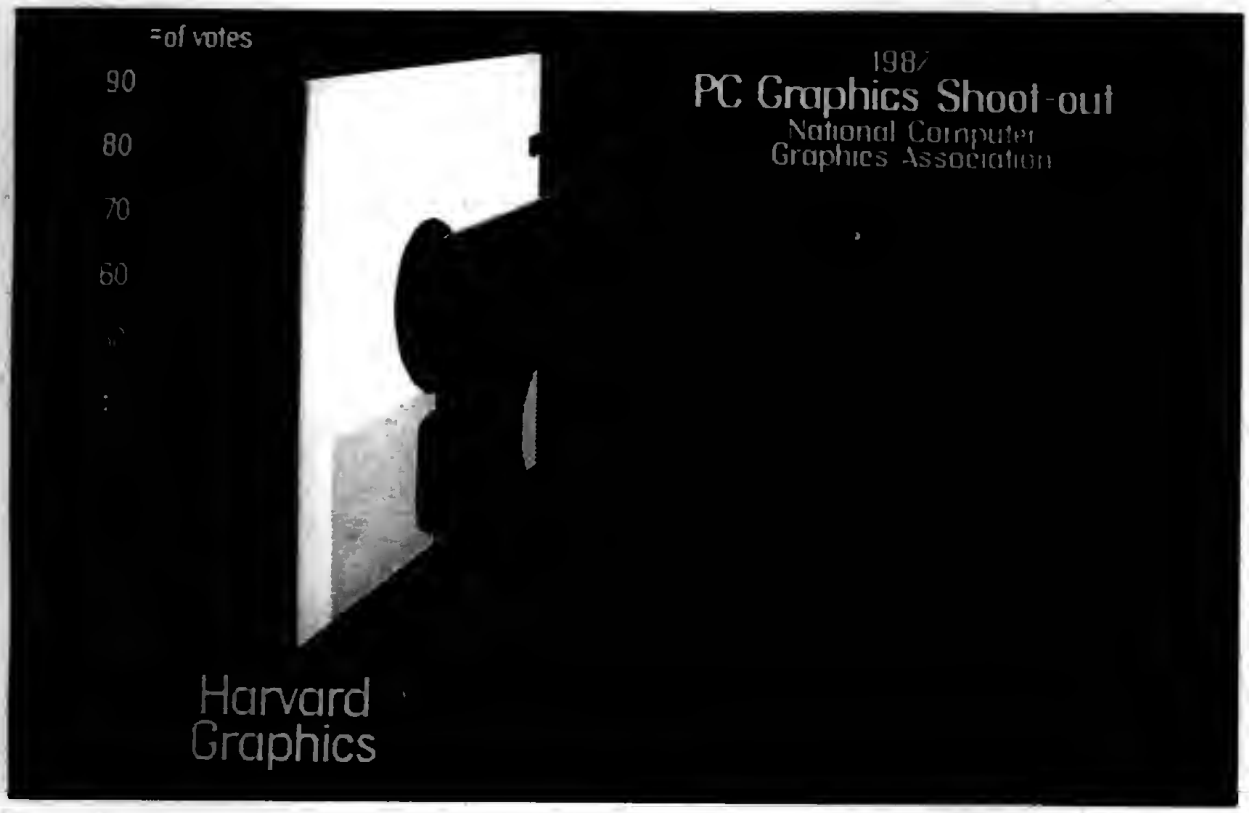

Graphic achievement.

New Harvard Graphics took on the competition at the National Computer Graphics Association's 1987 Shoot-Out, and won. Hands down.

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Enhanced TCP/IP nears completion

Development group strives to solve routing, net management shortcomings

BY ELISABETH HORWITT
CW STAFF

The Transmission Control Protocol/Internet Protocol (TCP/IP) networking standard should shortly gain some ground on its would-be successor, Open Systems Interconnect, in the race to deliver full-function multivendor networking to users.

At next month's TCP/IP Interoperability Conference in Arlington, Va., a consortium of vendors and users are expected to announce that the de facto standard will shed its long-standing interoperability kinks and gain some crucial network management capabilities.

Vendors should be able to start implementing the enhanced TCP/IP standard within a few months, according to Daniel Lynch, president of Cupertino, Calif., consulting firm Advanced Computing Environments.

USERS IN THE research community are trying to solve TCP/IP's internetwork routing glitches that have cropped up in the large, multisite networks they are building.

The TCP/IP Network Management and Gateway Monitoring Working Groups, which are part of the Internet Engineering Task Force, will meet Dec. 1 to present the current status of their efforts. Vendors that have participated regularly in the group's activities since its inception last May include Excelan, Inc., Bridge Communications, Inc., 3Com Corp., Communications Machinery Corp., Ungermann-Bass, Inc., Sun Microsystems, Inc., The Wollongong Group, Inc. and Data General Corp.

User members include Mitre Corp., a consulting firm that does network implementation, design and planning for the U.S. Department of Defense; the National Science Foundation; and Hewlett-Packard Co., which reportedly uses TCP/IP in its internal network.

Group members have focused on two areas of TCP/IP development, according to Lynch. Users in the research community, such as the National Science Foundation and Mitre, are trying to solve TCP/IP's internetwork routing glitches that have cropped up in the large, multisite networks they are building. For example, two different types of computers running TCP/IP can run into problems trying to exchange files over an internetwork bridge or gateway.

Vendor members of the workshop have also been working on routing problems, which they hope to have substantially solved in the next few months, Lynch said.

Network management has been the second major project for vendors, according to Lynch. Workshop efforts have focused on "solving log-in, access control, host and application status [notification] and other functions that allow users to manage network assets, as opposed to managing the network itself," Lynch said.

The emerging TCP/IP standard would also allow for the collection of network usage and operation statistics from LAN diagnostic devices such as The Sniffer from Network General Corp. and Lanalyzer from Excelan, Lynch added.

So far, the workshop has produced approximately a dozen large documents dealing with the above issues. While documentation is still not complete, the group has "defined the method and the protocols to form queues, ship data around the network and deal with entities such as modems that are not smart enough to be full-scale network nodes," Lynch said. Vendors want to define what types of data will be collected and how, then, "they still can differentiate their products through sexy proprietary network applications," Lynch said. It should take only a few months more before the protocols are ready for commercial implementation, he added.

While IBM and Digital Equipment Corp. have only been involved peripherally in the activities of the working groups, DG has been "heavily involved" in the groups' activities and will be introducing shortly some key TCP/IP products, according to Lynch.

While refusing to elaborate on specific plans for TCP/IP network management, Robert Ritter, a DG communications product manager, said the computer vendor will be announcing some significant enhancements to its TCP/IP products in the next six to nine months. TCP/IP, which is "a key element of DG's communications strategy," has already been implemented by the vendor as a way to link AOS and Unix systems on the same network, Ritter added.

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EDITORIAL

Drive to the future

DURING THE LAST DECADE, the price per megabyte of storage has fallen *more than 80%*, with drive makers packing more than 10 times the storage within the same footprint today than at the beginning of this time frame.

In the same period, the price of office space in major metropolitan areas like New York and Los Angeles — home to countless disk drive "farms" — has doubled. And storage requirements are growing at an unprecedented rate with the proliferation of end-user computing.

Mix all these factors together and what emerges are significant opportunities for MIS to exploit the rapidly evolving mass storage market and achieve economies that heretofore were unattainable. This week's Executive Report, beginning on page 71, explores these brave new storage worlds.

Recognizing the inevitability of ever-expanding storage needs, the international vendor community is throwing hefty resources at developing ever smaller and cheaper drives in a wider array of configurations. At National Advanced Systems, best known for its plug-compatible mainframes, disk drive sales will account for nearly half of the company's own projection of nearly $1 billion in sales next year. The Japanese and West Germans, largely shut out of the systems arena in the U.S., sense fertile storage market opportunities here and are bringing aggressively targeted and priced technology to market.

This is one vendor war in which users are the clear beneficiaries. By virtue of the intense competition in the 5¼-in. drive market, for example, storage costs there will plummet to the sub-$4 per megabyte range within two years.

One of the more compelling storage developments is the 5¼-in. drive arrays, which are essentially stacked drives that function in parallel and therefore appear to the system as one large drive. Some of the drive arrays being readied for 1988 shipments offer threefold improvements in drive failure rates.

For MIS, these continued developments mean a wider array of increasingly low-cost storage solutions but only as a result of carefully mulling the options that vendors are pushing onto the market. Thus, consider the following:

- While write-once read-many drives are inherently slow, they offer tremendous space economies at sites where the permanence and perhaps removeability of data is a requirement.
- Despite the beehive of development activity in small-platter drives, the big old 14-in. units that key IBM's mainframe direct-access storage device lines will continue to offer unmatchable performance and capacity for many applications.
- The biggest storage bottleneck, now and in the near term, is not capacity but data access, improvements to which will not come nearly as quickly as improvements in drive packaging.

LETTERS TO THE EDITOR

Timely follow-up

I found the profile article on Richard Leyh [CW, Oct. 12] to be interesting and informative.

To say the least, it was timely. Now that the future is history, I would enjoy reading a follow-up interview with Leyh.

His perspective on how his organization reacted to the stock exchange transaction volume that was generated Oct. 19 would be interesting.

Not many of us in this industry have to face the circumstances for which we are doing future planning so quickly.

I wonder how many other information systems organizations of similar size could react to the extreme increase in transaction volume and demand for resources as well as Leyh's organization seemed to.

John W. Boehlke
Perceptive Consulting for Business Computing
Denver

Clears the air

The Spotlight on personal computers and workstations [CW, Oct. 5] contained several items that I believe require clarification.

The Hardware Roundup listing for NCR Corp. PCs listed the operating system as proprietary.

All PCs manufactured by NCR are fully industry-compatible, running NCR-DOS, our version of Microsoft Corp.'s MS-DOS.

In addition, when we introduced our new family of PCs and workstations in May, we also announced our support of IBM's and Microsoft's OS/2 on these and future products.

As a corporation, NCR is fully committed to the use of industry standards and an open systems architecture across its product lines.

Vernon W. Yates
Vice-President and General Manager
Personal Computer Division
NCR Corp.
Dayton, Ohio

Servo standards

I was distressed when I read the article on write-once read-many standards [CW, Aug. 24]. The statement that it is known as "the OSI standard in honor of its most forceful proponent" is ill-conceived and erroneous.

Information Storage, Inc. has used the sample servo system since 1984. Since the first product shipments began in 1985, the company has attempted to gain acceptance of the sample servo concept.

Information Storage has been, since 1985, steadfast in its position on sample servo.

It has only been recently that Optical Storage International has changed its position from continuous groove to sample servo.

More recently, Information Storage has resubmitted a second sample servo standard proposal with a format providing 500M bytes per disk side.

The Optical Storage International division of Colorado Springs-based Laser Magnetic Storage International has also submitted a sample servo proposal that will provide for approximately 300M bytes per disk side. Information Storage's proposal is based on a field-proven technology with 3,000 systems installed. Laser Magnetic Storage has yet to deliver a production device incorporating its proposed sample system.

As a matter of interest, be advised that at a working committee level of ANSI X3B11, a straw vote was taken and seven U.S. companies voted for Information Storage's proposal while five Japanese companies and two European companies voted for Laser Magnetic Storage's proposal.

Steve S. Popovich
President/Chairman
Information Storage, Inc.
Colorado Springs

Continued on page 23

This week in history

Nov. 14, 1977
A bill is introduced in the House of Representatives that would create a Federal Information Practices Board to review and report on fair information and privacy practices of government agencies and business organizations.

Nov. 15, 1982
Computer leasing firm executives warn that a poor economy is drying up the necessary investment capital for third-party leases. As a result, users negotiating hardware leases through third parties may not be able to complete the transactions.

Computerworld welcomes comments from its readers. Letters may be edited for brevity and clarity and should be addressed to Bill Laberis, Editor, Computerworld, P.O. Box 9171, 375 Cochituate Road, Framingham, Mass. 01701.

OS/2: The promises of text manipulation

ESTHER DYSON

Comdex is a Rorschach test: What you see is what you want to see.

Comdex/Fall '87 was so big that there was room for each person's separate vision. As I gravitated to Lotus Development Corp.'s booth, where Agenda was being shown, I passed lots of boards and lots of software. Some of the boards were for IBM's Personal System/2, but they looked just like boards for the IBM Personal Computer. Some of the software was for OS/2, but it looked just like software for DOS.

When I got to the Lotus booth, I saw what I had come to see — the new generation of software that deals with text, can handle electronic mail and manage group interaction and will take the mess in my office and turn it into information.

My business problems have nothing to do with spreadsheets or with the kind of dry, repetitive data found in data bases. My problems — and those of the next generation of computer users — have everything to do with short attention spans and many tasks — a memo to answer here, a reservation to make there, a report to annotate, a sales projection to make.

DOS is OK for computer users who do one thing at a time, like financial modeling, typing letters or managing inventories. But new users won't want their computer to be dedicated to a single task; they will want it to be as flexible as they are.

Yet they want those disparate tasks to be connected, which is why they need OS/2 and not just some hypervisor that lets them run multiple programs simultaneously. OS/2 will have the interesting capability of making independent software packages into modules of software that work together easily.

That's the promise, but there wasn't much of it at Comdex. The few OS/2 packages I saw

Continued on page 22

Dyson is editor and publisher of "Release 1.0," a leading newsletter about the personal computer business and the transformation of artificial intelligence into a commercial technology. She is also president of New York-based Edventure Holdings, which publishes "Release 1.0" and holds the annual PC Forum.

Learning to maintain objectivity

MICHAEL SULLIVAN-TRAINOR

The law firm's in-house MIS consultant needs a plan to combine five departmental accounting systems into one centralized system to meet federal requirements. But first, he has to tell the senior partner how such a system could be up and running in just 20 days.

Flanked by his skeptical staff, the senior partner stands with his arms folded, his bushy eyebrows slanted downward in a dark frown.

Consultant: "We can put the whole system on an off-the-shelf personal computer program, and it will be producing in no time."

Senior Partner: "A PC? How can I trust my whole business to one of those?

Consultant: "Well, it's not the best solution. But other options would be more expensive and require more time. If you could give us an extension on the deadline . . ."

Senior Partner: "Everytime I talk with you people, you want more time to study the problem. I never see any results. I spend more time in meetings with you guys than with my own staff."

The senior partner in this scene is L. Paul Ouellette, a partner in Arnoudse and Ouellette Associates, Inc., a Bedford, N.H., MIS training firm. The consultant is acting as well, a participant in a highly interactive workshop on consulting skills for MIS professionals.

The session allows MIS professionals to work through the hazards of dealing with the uncooperative "senior partners" they might encounter on the job.

Two other "consulting teams" presented solutions to Ouellette in his role as the senior partner, which he plays so rudely and aggressively that participants react to him with all the emotion they would bring to a real situation.

The chief skill learned in these exercises is that the minute the consultant gets hooked

Continued on page 22

Sullivan-Trainor is a *Computerworld* senior writer.

Stress up, burning eyes down

Are we becoming a nation of sore-shouldered, irritable computer jockeys?

JOHN KIRKLEY

How are you feeling these days? Any rashes, back pains, fatigue, nervousness, swollen muscles or joints?

How about stomach pains, irritability, burning eyes or tense neck and shoulders?

Take heart. You're probably not dying of some esoteric disease or suffering from radon exposure. More than likely you've been sitting in front of that computer again, banging away at the keys and staring fixedly at the little glowing symbols on the screen. You, like many others, may be experiencing the health-related complaints associated with operating a VDT.

The Data Entry Management Association (DEMA) in Stamford, Conn., is among the folks concerned about this 20th-century health hazard. Each year the group surveys clerical and data processing employees to find out how the troops are faring with the new technology.

It turns out the troops are not faring well.

Norman Bodek, editor of the DEMA newsletter, reports that there was only a slight improvement in VDT-related complaints from the previous year's survey. "We're not making as much progress as we should," Bodek commented irritably, no doubt as he was reviewing the results on his personal computer screen.

Of the 514 operators and clerical employees surveyed, 66% reported painful neck and shoulders. Happily, burning eyes were down in 1986, but a whopping 47% still reported the symptom, compared with 54% in 1985. Blurred vision was up 6% to a record 44%.

Data entry operators fared worse than the clerical employees, but Bodek reports that the clerical worker's lot is hardly a cause for rejoicing. "There's no reason for this many complaints — 38% of clerical workers complained about painful necks and shoulders," Bodek said. "And 36% had burning eyes, 25% had back pain and 42% complained about fatigue. This wouldn't be the case if we were more conscious about the needs of our employees."

BOB EMERSON

Management, he concedes, is trying. Such niceties as adjustable foot rests, antiglare screens and improved lighting are showing up in the workplace. Recommended improvements include ergonomic chairs, light bulbs with less glare, more space between desks and proper ventilation, especially where smokers are present.

In fact, Bodek, once a three-pack-a-day man, recommends that smoking be banned from the workplace altogether. He advises yoga or meditation as a substitute, a suggestion that is sure to make smokers even more irritable, nervous and fatigued.

The work done by organizations like the DEMA becomes more important every day. VDTs, whether in the form of workstations or PCs, are on their way to becoming as common as telephones.

For example, there is a distressing tendency on the part of large banking and insurance companies to build offices with desks, VDTs and thousands of data entry workers lined up row upon row, like squadrons of wind-up dolls, all flailing away at the keyboards.

Alexander Cohen, chief of Applied Psychology and Ergonomics at the National Institute of Occupational Science and Health (NIOSH), reports there are 15 million to 19 million VDTs in the U.S. workplace. He expects that number to increase to 40 million by the year 2000.

Stress, NIOSH found, can come to these millions of operators from causes other than bad lighting or poorly designed chairs. Slow terminal response times, on the order of three to 10 seconds, can cause operator irritation.

Also, the name "incentive pay" turns out to be an oxymoron; slower operators can't earn the incentives and faster operators feel rushed. All were upset by the common practice of supervisors monitoring keystrokes to determine productivity.

Although the DEMA report focuses on VDT operators, the number of people today who are possible candidates for aches, pains and eyestrain is obviously much higher.

Computers are everywhere, at home and at work. Computers have made it possible to combine the two — the machine used during the day to earn a living may also be used at night for other purposes.

Back to U2

Fortunately, there are remedies. In addition to those mentioned above, it turns out that computer operators, once up to speed, are not only soothed but made more productive by being allowed to wear headphones and listen to their own preferred brand of music, be it J. S. Bach or U2. (However, one Texas firm reported that when employees were allowed radios and headphones, productivity dropped. It seems some people were getting lost in daytime soaps, and others were pilfering their neighbors radios and batteries.)

Many Japanese workplaces have instituted twice-a-day exercise breaks and report good results. Keyboard and screen flexibility are also cited as ways to alleviate muscular and skeletal complaints.

However, there is a unasked question in the DEMA survey

Continued on page 22

Kirkley, a former editor of *Datamation* magazine, is an industry consultant currently acting as editorial adviser to Patricia Seybold's Office Systems Group. He is based in South Nyack, N.Y.

Promises

CONTINUED FROM PAGE 21

were basically rewrites of existing programs or programming tools.

Yet there were clear forerunners to the kind of groupware packages OS/2 servers will make possible — not just multiuser data bases, but software that actually coordinates and manages the interactions among people. Call it intelligent electronic mail or active project management, along the lines of Lifetree Software, Inc.'s Team, Action Technologies, Inc.' Coordinator, Broderbund Software Inc.'s For Comment — all shown at Comdex. Even in their DOS/Unix implementations, they offered exciting intimations of what we'll see.

All these software products deal with text. Where does it come from? That's what optical character recognition scanners are for, and they proliferated in Las Vegas. They indicate that there will be a lot more information on-line in years to come. This is good news for me: Instead of giving my secretary a pile of papers to file, I can give her a pile to scan. Instead of deciding where to file each item — "Comdex," say, or "OS/2 impact" — I can give each item several key words.

'To-file' piles

Better yet, I may stop keeping my "to-file" piles — stuff I want to get to right away. For me, the impact won't be so much that I can find everything, but that I no longer have to worry about losing it.

Yet I do want a way of finding it, sorting it and categorizing it. For that, I could use Agenda or Persoft, Inc.'s IZE. IZE will look through text files and build a table of contents of the documents you have stored. People frequently confuse IZE with just one more text-search program that helps you find a particular piece of text. But in fact, it's more like text-mapping, so that you know what you have.

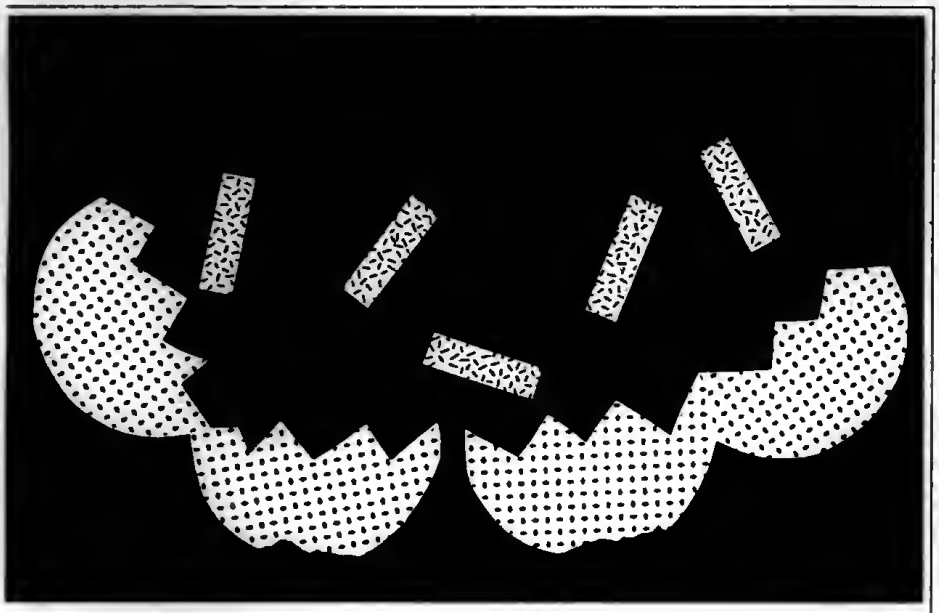
Alternatively, I could do a little more work and get a lot more work out with Agenda. It will do the same sort of categorizing as IZE and then provide me with information that has lots of structure.

For example, since I am planning a trip to Cupertino, Calif., it could automatically list all the people I know there and their phone numbers. Agenda could provide a list of my favorite hotels. I could answer a phone call and automatically display all the memos I've filed concerning the person calling.

And then there is Network Technologies International, Inc.'s Docuforum, which is ostensibly a multiuser, document-editing program but is actually a good way to store and manage textual information. The "chapters" are the topics of the textual information, and the editing annotations are the textual additions, organized by topic. Docuforum doesn't do as much rearranging on the fly as Agenda or IZE; it's more like a library than a malleable data base.

In short, this Comdex whispered that the excitement in the next few years won't come from better spreadsheets or even from prettier output of text or data. The excitement will come from a profusion of tools that will do all kinds of things with text. Products that look similar now will become more clearly differentiated as time passes and as we learn how to think about the text-based capabilities we barely knew we wanted.

Up to now it has been much harder to automate the manipulation of text than numbers, and we've hardly even tried. But the payoffs will be huge. Most of us deal with text far more often than numbers. After all, would you have read this article if it had started this way: $345 + 34508 = 45x. (y - z)/56.806 = 45c^2n/b + a \ldots$?



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Objectivity

CONTINUED FROM PAGE 21

emotionally, he begins to lose control of the meeting. Rather than arguing with the senior partner or backing down in their presentations, participants are urged to be objective and let the client or user vent his frustrations.

The third team was the most successful. They promised that a system would be in place in 20 days. It would be a combination of manual and automated systems similar to the ones already in place but with the inefficiencies addressed to meet federal concerns. Meanwhile, the group would conduct a needs analysis and be ready to present a plan for a more sophisticated, centralized system in six months.

The sour senior partner didn't like that solution better, but at least he felt MIS had listened to him and responded with more than just a promise to plug him into the next system development cycle.

Stress up

CONTINUED FROM PAGE 21

and others of its kind that I have seen. It has to do with the activity itself — the act of sitting at a VDT for extended periods. The questions goes something like this: Is this work really the kind human beings are suited for? To put it another way, are these featherless bipeds — who only recently in their evolutionary history came down from the trees — really adapted to sit for hours staring at a screen and tapping on plastic keys?

Not only do I not know the answer, I'm not even sure the question is valid. All I know is that my back hurts and my eyes are burning. It's time to hit the print button and go for a walk.

Avoid war metaphors

I would like to comment on the front-page article "Spreadsheet battle lines drawn" and the In Depth story "Three vendors give Cray chase" [CW, Oct. 12].

The lead-in text for both articles and the illustrations that accompanied them were extremely militaristic.

The front-page chart included cute little tanks and soldiers, and a jet pilot being pursued by three jet fighters was depicted in the In Depth illustration. In a time when thousands walk, march, demonstrate and work for peace around the world, doesn't it seem anachronistic for *Computerworld* to be stuck with cliched war-oriented metaphors? Doesn't your promotion of warlike attitudes seem outdated?

Harry Marshall
Belfast, Maine

Never too soon to start

Carl Cargill's Reader's Platform article [CW, Sept. 14] caught my interest because I, too, am involved in software standards at both a national and international level.

Although I am not familiar with the software ergonomics effort that was the subject of his article, the problems foreseen and arguments presented are all too familiar.

Cargill's warning about the premature development of software standards and the effect they might have on the information technology industry echoes a similar debate I find myself in often.

Should standards lead state-of-the-art technology, or should they lag the state of the art?

I agree with Cargill that such standards will prove to be useful and that the U.S. needs to be more involved in their development.

I cannot agree, however, that such work is being done prematurely. I also disagree that there is any pending software disaster.

The time for software standards, even if just rough cut or prototypical, is before more applications are developed. Otherwise, the standards in the development of new applications will be de facto and often far from optimum.

Many de facto software standards already exist and continue to be reinforced with new products. Lotus Development Corp.'s 1-2-3 Command Line, for instance, is common to dozens of personal computer-based programs. In addition, Apple Computer, Inc.'s Macintosh Interface is becoming a popular program interface paradigm.

This is not to criticise those styles of interface but to question whether it is better to allow the popularity of an application that is created by a single vendor to set the standard as opposed to a consensus that is reached by a standards-making body.

It is true that the cognitive processes of humans are not well understood, and Cargill used this point to argue that software ergonomic standards development is premature.

I feel, however, that this argument is not strong enough to counter the reason that there is an immediate need for software standards. There is a difference between software standards and other standards.

Rather than being based on measurable, repeatable performance or characteristics, software standards exist to assure that the performance or characteristics are measurable and repeatable.

Software standards, ergonomic or otherwise, are needed now to avoid the diversity that will result from the lack or delay of such a standard. The real disaster will be the standardization efforts that try to reconcile that diversity.

The software disaster foreseen by Cargill is a paper lion. As a participant in standards-making activities, I do not think software vendors will be led into a software disaster.

There will be no need for massive rewrites of software, because both software and standards will evolve together over time as they are tested and used and new things are learned.

In addition, there will be a proliferation of different software standards with the same objective, and it will take years before they are sorted, weeded and productively put to use and the real standards are determined. Even poor standards will at least get people talking and thinking the same way.

I must concur with Cargill that there is a great need for participation of U.S. representatives in national and international standards-making activities.

Without it, the U.S. will be working with software yards instead of the software meters used by the rest of the world.

William C. Burkett
Senior Engineer
McDonnell Aircraft Co.
St. Louis

Don't underestimate

In the article "What threatens mainframe computing?" [CW, Oct. 19], author Fred Viskovich comes to the astounding conclusion that an IBM Personal System/2 Model 80 is equivalent to an IBM 4381 Model 12.

How can anyone that is involved in data processing take such an absurdity seriously?

Viskovich based his claim on a comparison of million instructions per second (MIPS) between the two machines after having asserted that the instruction sets of both machines are functionally identical.

This is silly. If it takes several PS/2 instructions to perform the equivalent function of a single 4381 instruction — a fact Viskovich conceded — then instruction rates of the two machines cannot be directly compared.

IBM does not supply instruction rates for its mainframes but rather expresses the machines' power in their relative throughput.

Viskovich attempted to forestall a discussion of throughput by suggesting that loading a data base into the PS/2's memory will more than compensate for any shortcomings of personal computer-based disk storage.

Accessing memory is definitely faster than accessing a disk, and the technique would be used in the mainframe world if it were a good idea. But I think it is a lousy idea.

Computerized applications must constantly guard against catastrophe — such as accidentally pulling the plug on a PS/2 — by writing updated data base records back to the disk so that the results of the update are still present following a system failure.

It is one thing to lose a spreadsheet; it is something else entirely to lose an entire day's invoices.

In addition, Viskovich went on to state that throughput is not an important issue; rather, he said that the issue should be which paradigm should be used for problem solving. In every data processing installation in which I have worked, throughput was not just a concern, it was *the* concern.

On occasion, system integrity takes a backseat to throughput. I do not think Viskovich understood throughput — he most certainly did not appreciate its importance.

Murphy Motor Freight Lines, Inc.'s 4381 handled 12G bytes of on-line disk storage, 30-plus hours of printing daily on two system printers, more than 220 remote terminals and 48 local devices and 80 to 100,000 IBM CICS transactions per day.

The system delivered three-second response time remote and subsecond response local, with the 4381 idling nearly 40% of the time. It is difficult to envision a network of PS/2 systems that could supply the same throughput for the same dollars.

Viskovich did not feel he should be constrained by the limits of currently available technology: "It is absolutely critical that . . . systems planning is not unreasonably constrained by constant reference to what currently exists. . ."

This is wonderful stuff. Viskovich felt free to imagine whatever make-believe-ware (nonexistent hardware and software) he needed to support his position. With the freedom to create make-believe-ware as required, anyone can design systems of umpteen MIPS and spectacular throughput.

David W. Dick
Former Data Processing Manager
Murphy Motor Freight Lines, Inc.
St. Paul, Minn

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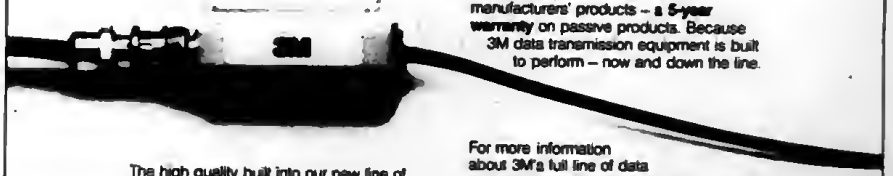

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SOFTWARE & SERVICES

SOFT TALK

Jerrold M. Grochow

CASE pilot caution urged

Introducing computer-aided software engineering (CASE) technology to your organization is, in effect, introducing a new way of operating your department.

Evaluating CASE tools, therefore, requires a different approach than would be applied to other types of software products.

Using a "pilot project" approach enables you to evaluate both the tool's functionality and its potential impact on your department.

Selecting tools

Before you begin your evaluation, your system engineering group should ensure that you are making an apples-to-apples comparison. Just because the tools are CASE doesn't mean they support the same methodologies or even life-cycle phases.

One Fortune 1,000 company recently sent out a request for proposals to two analyst workbench vendors, two application generator vendors, one methodology vendor and an accounting firm. Unless they plan to combine several products and methodologies, they are going

Continued on page 31

Software AG on the rebound

Firm's broader line draws praise from mixed-environment users

BY CHARLES BABCOCK
CW STAFF

MIAMI BEACH — Dale Losier supervises the procurement of software at the U.S. Department of Energy's Savannah River Laboratory in Aiken, S.C., and he was impressed with a recent battery of announcements from one of his site's primary suppliers, Software AG of North America, Inc.

With 3,000 IBM Personal Computers and Apple Computer, Inc. personal computers, dozens of Digital Equipment Corp. Microvaxes and VAXs and three IBM mainframes at the sprawling, 300,000-acre site, Losier said he has a special interest in a company that can supply distributed data base products for a mixed-hardware environment.

He said he liked the announcement that Software AG will supply an optimizer for its fourth-generation language, Natural 2, that will allegedly enable the language to outperform Cobol. "Anything that can beat Cobol has got to be a winner," he said during the opening night party at the Hilton-Fontainbleu Hotel for the 2,000 attendees of the Software AG user conference, held here Nov. 2-4.

Losier exemplifies the enthusiasm expressed by customers with mixed environments after Software AG's announcements on the opening day of the conference.

As frequent users of the Adabas data base management system and Natural 2 fourth-generation language, the users seemed happy to see the mainframe-oriented software house branching out. The availability of related products on the VAX would push them toward greater reliance on DEC minis, several users said.

"I'm more impressed than in years past with the variety of

Continued on page 31

DEC links data base to IDMS/R

BY CHARLES BABCOCK
CW STAFF

MAYNARD, Mass. — Digital Equipment Corp. is hammering away at barriers between users of its VAX processors and IBM mainframes with Version 2.0 of a 1½-year-old product, Vida With IDMS/R.

Version 2.0 of Vida With IDMS/R allows current users to upload a data base table from DEC's relational data base management system, RDB/VMS, on a VAX processor into an IDMS/R DBMS table on the mainframe, said James K. Steiner, DEC's product manager in the data base systems group.

IDMS/R is a product from Cullinet Software, Inc. in Westwood, Mass.

Version 2.0 does not communicate directly with IDMS/R. Instead, it uses DEC's Decnet/Systems Network Architecture interconnect networking to communicate with an intermedi-

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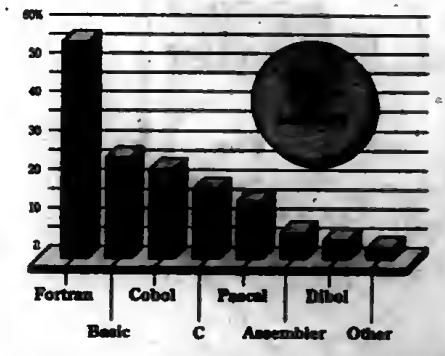
Data View

VAX programming languages

Fortran leads the way at most sites using DEC VAX languages



INFORMATION PROVIDED BY COMPUTER INTELLIGENCE

Query tool aimed at IMS

BY ROSEMARY HAMILTON
CW STAFF

CHATSWORTH, Calif. — Sterling Software, Inc.'s Dylakor Division recently added a natural language query facility to its interactive data retrieval system for IBM's IMS.

Release 5 of DYL-Inquiry/IMS will reportedly allow programmers to set up a directory of simple English-language commands, such as Show, that can be used in place of the Inquiry/IMS language.

The directory is intended to assist non-MIS employees in ac-

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Inside

- Visual Software, Index Technology enhance CASE tools. Page 26.
- Uniplex upgrades Unix OA software. Page 27.
- NCR Tower family gets new software packages. Page 32.

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Visual ties CASE tool to IBM; Index unveils new Excelerator

BY CHARLES BABCOCK
CW STAFF

In the second release of VSdesigner, a computer-aided software engineering (CASE) design tool, Visual Software, Inc. has provided ties to IBM's VM/SE, allowing host control of an IBM Personal Computer or Personal System/2 workstation.

The link allows a software developer to store design information on a mainframe, a file server or at the workstation, noted Visual Software President David West.

Design information can also be archived and transferred over an IBM Token-Ring network or PC Network as well as over Novell, Inc. and 3Com Corp. networks.

In addition, Release 2.0 of VSdesigner can be linked to code generators that generate applications based on its designs and data base information.

Developers may need an additional product, VSSQL Advanced Query/Report Generator, in order to extract the information from the data base through SQL queries to load it into a structure that is processed by the code generator. VSSQL Advanced Query/Report Generator costs $995.

Release 2.0 of VSdesigner supports three additional design techniques: Entity Relationship Diagrams, Real-Time Extensions and Action Diagrams. As in the earlier release, it also supports Yourdan, Warnier-Orr and Visual Software methodologies, according to West.

Through an additional $995 option, which is called VSobject Maker, designers may introduce customized symbols into the design or combine symbols from different methodologies into one design, West explained.

VSdesigner provides native support for IBM's advanced graphics adapter, Video Graphics Array, introduced with IBM's PS/2, allowing 1,024- by 768-pixel resolution.

Supports HP, IBM printers

VSdesigner also provides support for the Hewlett-Packard Co. Laserjet Plus and Laserjet II printers and IBM's Proprinter as well as the dot matrix models previously supported.

VSdesigner is priced at $7,500 per copy, with volume discounts available. Fifteen copies are $4,600 each. VSdesigner runs on an IBM PC, PC XT, AT or PS/2.

Visual Software was founded in 1984 in Santa Clara, Calif., to develop CASE tools. It is an IBM Authorized Industry Marketing Assistant.

Improved Excelerator out

Index Technology Corp. in Cambridge, Mass., the producer of the Excelerator front-end analysis and design tool, said it is shipping an enhanced version of Excelerator with an Extended-Analysis Facility.

The PC-based tool now offers 33 analysis reports and 25 matrices to help system analysts evaluate the completeness, consistency and efficiency of system and data base designs.

Although Excelerator previously provided for the tracking and checking of information in a system's design, it could not provide the sophisticated analysis functions now available in Excelerator Release 1.8, according to Chris M. Grejtak, Index's vice-president of sales and marketing.

The matrix analysis capability was developed by Deltacom, Inc., a software company that was recently acquired by Index.

Aids affinity analysis

Release 1.8's Extended-Analysis Facility provides assistance in affinity analysis, data modeling and extended structure analysis.

Affinity analysis provides information on record content, screens and reports. Records that are empty, incomplete or redundant can be eliminated, improving efficiency in data base design. Screen and report data help ensure the consistency of input and output data by identifying screens and reports with similar contents, Grejtak said.

Data modeling analysis provides matrices or reports for key validation analysis to locate records with missing, mislabeled or multiple keys. It also provides data model validation analysis to compare connections on data model diagrams with data relationships described in the dictionary. Data normalization helps check the efficiency of data base design.

Index officials claimed Excelerator is the first personal computer-based tool that allows checking of data modeling normalization.

Extended structure analysis provides a series of reports and matrices that tracks the use of data at its lowest level to ensure that it can be processed according to the design.

Excelerator 1.8 is available at a price of $8,400 per copy, with volume discounts available. It runs on Digital Equipment Corp. Vaxstations, Apollo Computer, Inc. workstations and Sun Microsystems, Inc. workstations as well as IBM PCs and PS/2s.

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Uniplex-II Plus features source code-level integration

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — Uniplex Integration Systems, Inc. in Dallas is offering spreadsheet, windowing and printing enhancements in Version 6.0 of its office automation software for Unix systems, Uniplex-II Plus.

Tony Heywood, Uniplex's executive vice-president, said Version 6.0 was announced late last month at a time when the firm was bidding on several big federal contracts and had signed several major OEM deals.

In September, Uniplex made a series of OEM agreements with Prime Computer, Inc., Pyramid Technology Corp. and Cromemco, Inc.

Last month, it formed Uniplex Distribution, Inc. to distribute Uniplex products in North America, Heywood said in an interview here.

Integration abilities popular

Uniplex-II Plus, a multiuser system with word processing, spreadsheet, relational data base and graphics features, is known among users for its high level of integration among applications [CW, July 6]. Uniplex-II Plus offers integration at the source-code level rather than at the menu level.

Users do not have to purchase standalone software packages that require retraining and switching from package to package, Heywood said. The product runs on 40 different processors, including microcomputers, minicomputers and mainframes.

Version 6.0, set to be available early next year, provides internal and external windows, the vendor said. Internal windows allow users to work simultaneously on different sections of the same file; external windows allow users to work in another application without leaving their original task.

In addition, the vendor said, Version 6.0 adds a spreadsheet interface similar to that of Lotus Development Corp.'s 1-2-3, as well as a print composer so users can take advantage of laser printers through the use of proportional spacing and multiple fonts.

The new version allows users to record sequences of routine keystrokes so the sequences can be repeated with a single keystroke, the vendor added.

The cost of Version 6.0 of Uniplex-II Plus ranges from $795 for a microcomputer to $23,995 for a mainframe. The cost for use on an AT&T 3B2 minicomputer is $2,495.

Companion packages out

The vendor also announced two fully integrated companion packages.

The Advanced Graphics System allows users to take advantage of high-resolution terminals to create bit-mapped graphics. The Advanced Office System includes electronic mail, report generation, time management functions and a directory for names, addresses and telephone numbers.

The graphics package price ranges from $375 to $7,195, depending on the hardware; the cost for a 3B2 mini is $995.

The advanced office package ranges in price from $325 to $9,595, and the cost for a 3B2 is $795, according to the vendor.

Heywood said several prime contractors are including Uniplex software in their bids for the U.S. Air Force procurement of 20,000 multiuser Unix systems.

In addition, Uniplex was selected by Magnavox Electronic Systems Co. in Fort Wayne, Ind., as part of a team bidding for a major U.S. Army contract.

DEC links

CONTINUED FROM PAGE 25

ary, Cullinet's Information Center Management System (C/ICMS), according to DEC.

Language statement added

The ability to upload was added by providing a Digital Command Language statement to Vida with IDMS/R that copies an RDB/VMS table into C/ICMS, where it can be uploaded into IDMS/R, Steiner said.

"You can use it as another IDMS/R table or apply it to a production data base" using Cullinet's Online Query tool, Steiner said.

The initial version of the product provided read-only access of IDMS/R files for users of VAX relational data base applications.

More access options

"One of the big things about this version is you can use SQL to access data in data bases on both the VAX and in Cullinet's IDMS/R," Steiner noted.

The VAX SQL used to access RDB files can be used to send SQL queries over Vida With IDMS/R to IDMS/R. The SQL queries can be static (embedded in applications) or dynamic (end-user formulated.)

The product is available immediately at prices from $5,250 on the Microvax to $52,500 on the VAX 8800.

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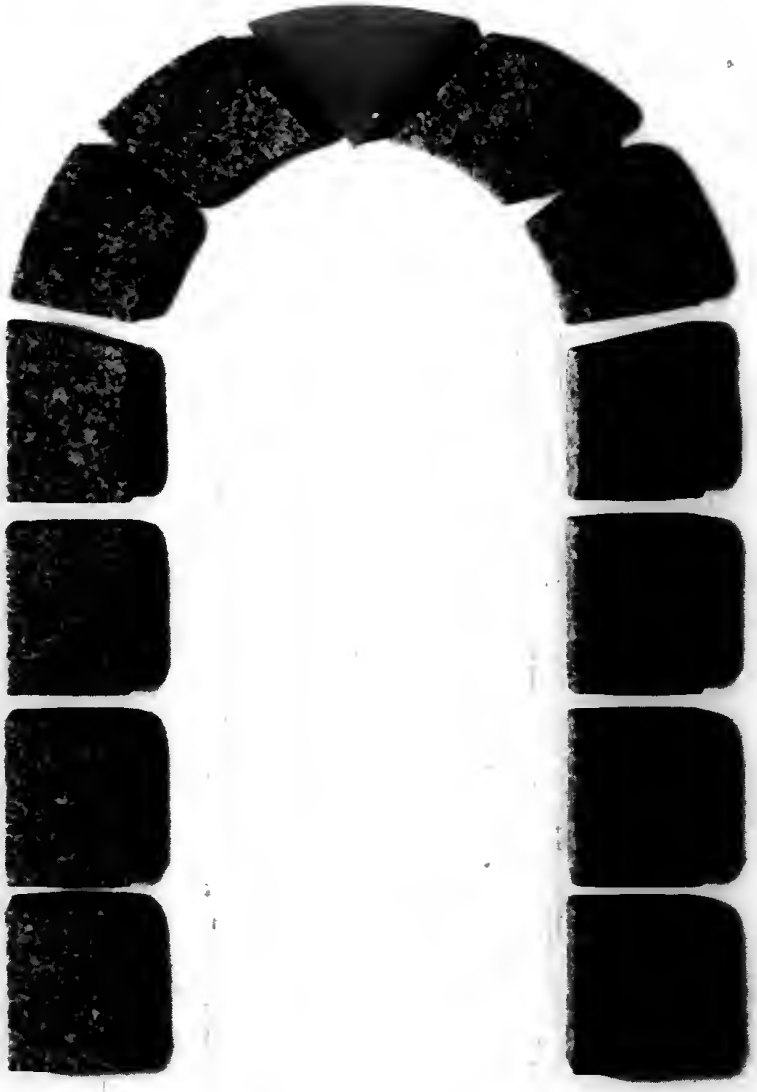

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SOFTWARE NOTES

DEC, SAS to comarket system for VAX users

Digital Equipment Corp. and **SAS Institute, Inc.** have agreed to an exchange of technical resources to keep the SAS System in step with the DEC VAX and workstation developments.

The two companies will comarket the SAS System under a DEC Cooperative Marketing Program agreement. SAS moved the SAS System to VMS two years ago, and VAXs now account for about 20% of the company's new sales.

Computer Intelligence says SAS is the most widely installed statistical analysis package on the VAX, with 4,000 SAS products at 1,700 VAX sites.

Government agencies that license the 20/20 spreadsheet from **Access Technology, Inc.** in Natick, Mass., will be given a free license for a spreadsheet-based Payroll Decision Support System, Access representatives say. 20/20 is now sold through the General Services Administration.

Software that is said to help insurance underwriters evaluate the risk of an application is in use at **Northwestern National Life Insurance Co.** in Minneapolis. It is based on a text-management system, Inquire/Text, from **Infodata Systems, Inc.** in Pittsford, N.Y. It includes a medical data base of 1,500 risk factors.

Texas Instruments, Inc. and **CACI, Inc.-Federal** in Arlington, Va., a Department of Defense mainframe software developer, will establish a **DOD Information Engineering Technology Center** to advance the use of computer-aided software engineering methodologies. The Fairfax, Va., center will promote the use of TI's Information Engineering Facility.

More than 40 user organizations have agreed to use and evaluate prototype software developed by the **National Bureau of Standards** for data dictionaries used in data base management systems.

The users are evaluating software that implements a draft industry standard for the Information Resource Dictionary System (IRDS). A final IRDS standard is expected to be issued next year by the bureau and the **American National Standards Institute.**

Relational Technology, Inc. has added **Automatic Data Processing, Inc., Control Data Corp.** and **Atex, Inc.** to its list of value-added resellers. ADP will build its Apecs/8000 project management software on top of Relational Technology's Ingres relational data base management system. CDC will integrate Ingres into its MP2000 accounting package for law firms. Atex will use Ingres as a component of its publication data base system.

Software AG

FROM PAGE 25

products they're bringing out," said Steven Carter, a 10-year veteran of Software AG users group meetings and a member of the Database Utility Group, Inc., an Adabas consulting firm in Federal Way, Wash.

"We're bringing our children out of the woodwork," said E. Linwood Pearce, executive vice-president of Software AG in Reston, Va.

Software AG President Stuart Miller said the company is in a position to finance continued product development, with revenue crossing the $200 million mark this year, when the West German figures are added to the North American partner's sales. Both firms sell the same product line, with the bulk of development occurring in West Germany, company officials said.

Software AG's Pearce

Faster than Cobol

Neil Lyman, director of technical services for Elizabethtown Gas Co. in Elizabeth, N.J., said he saw a demonstration of Natural Construct, Software AG's code generator that produces optimized Natural code and concluded it executes faster than optimized Cobol. Elizabethtown Gas is in the process of converting its Cobol applications to Natural 2 and is talking to DEC about its future processing needs. Natural 2 will run on a VAX as well as on IBM mainframes, and the availability of both Adabas and the fourth-generation language for the VAX "make it much more plausible to go DEC," Lyman said.

David Ostrom, administrative systems manager at Washington State University in Pullman, Wash., said the university uses both an IBM 3090 Model 200 and a VAX 8200. So far, the computers serve distinct functions, and the school has not built any applications to run on both. With Software AG's new networking products, "it's extremely exciting to figure out what we might do," Ostrom said.

Adanet interest

The City National Bank in Los Angeles provides data processing service to 200 other banks, and Jeff P. Chroman, vice-president and data base manager, said he expects his firm will be an early user of Adanet, Software AG's data base networking product due out in the third quarter of next year. "We would like to do cooperative processing. If a branch wants information on a customer and it's located at another branch, Adanet would allow us to retrieve it," he said.

Andreas Zimmer, a data base administrator for West German surgical wholesale house Gehe AG, said the Adanet announcement was the most interesting. "You can't have useful departmental processing without distributed data base-transparent distribution," Zimmer said.

"People want data at their own site, not on the mainframe," agreed Rod Phillips, systems programmer with the Federal Aviation Administration in Oklahoma City. Adanet was designed to dynamically route queries and execute two-phase commits for updating distributed data bases.

Warren Burnette, of the South Carolina Department of Social Services, said his employer was attempting to rewrite its existing applications rather than develop new ones. He said he was not impressed with Natural Construct, the code generator. "I don't think it will fit what we're doing," he said.

Query tool

FROM PAGE 25

cessing IMS data without having to use a sophisticated programming language.

Commands must match

Each command in the user directory must correspond with a command in the Inquiry/IMS language.

For instance, the programmer would write that the command Show equals, or corresponds to, the Display command that is a part of the Inquiry/IMS language.

A programmer could assign a number of English words to equal one command in the Inquiry/IMS language.

Licensed by 300

Inquiry/IMS is an interactive on-line tool that allows users to access information in the IMS data base. Sterling said approximately 300 user sites have licensed the tool.

Sterling also said it has improved the installation procedures for Release 5.

Previously, each terminal that would be accessing IMS had to be defined to the system. With Inquiry/IMS Release 5, terminals can be defined by groups, according to the vendor.

For example, instead of identifying all terminals in the accounting department, they can be identified by one terminal definition.

Release 5.0 of DYL-Inquiry/IMS, which is scheduled for availability in the first quarter of next year, will carry a $40,000 license for new users.

Current users under maintenance contracts can upgrade free of charge, according to Sterling.

CASE pilot

FROM PAGE 25

to have a very difficult time comparing the responses.

Select pilot projects that are performing work that will benefit from the specific tools you are looking at. A project team that is under the gun with a tight deadline or a difficult client may view the introduction of CASE tools as a burden it doesn't need. A good way to turn a project manager off to the idea of CASE is to force the use of new tools and techniques onto an already difficult situation.

On the other hand, make the evaluation more than just an exercise. A team performing a Business System Planning study for the production department of a major oil company saw a way to save significant clerical effort by learning and using a new CASE strategic planning tool.

The team's input to the software engineering group was a very thoughtful evaluation that included suggestions on what to look for in the "ideal" product — and how to adapt the one under study if it was eventually chosen.

This points up another factor in doing a successful CASE evaluation. Make sure the pilot project is staffed by "can-do" people who are well versed in your development techniques. You don't want your evaluators still figuring out why they need entity-relationship diagrams if they are supposed to be comparing how well a particular tool provides data modeling capabilities.

How to compare features

While there are many factors that go into a tool selection, sooner or later you will compare competing tools on the basis of features. Make sure the pilot projects give the tools a thorough review (remember that you may be committing your entire organization to using them for a long time), but focus on major features.

Minor differences and annoyances will often be fixed or different in the next release of each product. Many CASE tool vendors are coming out with new releases two or more times a year just to keep up.

Remember, also, that any feature-by-feature comparison only tells part of the story and that decisions based on a single score from a features matrix are often wrong.

Features need to be looked at in groups to see if they really do the overall job for which they are intended. For example, your evaluators ought to provide a score for the total drawing capability of an analyst work bench product rather than a rating for each of the 20 or more individual drawing functions.

Similarly, the entire product needs to be given an overall rating to compare it with others in its class.

These overall ratings are much more difficult to make than individual feature ratings, but they are also much more important. The individual features matrix can be used as input, but you should encourage a higher level, broader view when people are making their final product rankings.

Good support from your software engineering group is one way of helping project teams in doing this kind of evaluation and in establishing consistency across pilot projects.

The other problem

Improving productivity isn't just a matter of selecting a few pieces of software and installing them.

You have to start with a strong management commitment and follow through with an ongoing program of staff training and support. But the tools are what it is eventually all about.

Through the involvement of your software engineering group and several pilot project teams, you can help ensure a choice of CASE tools that will be effective in your organization.

Grochow is vice-president of the Corporate Technology Group of American Management Systems, Inc. in Arlington, Va.

NEW PRODUCTS

Systems software

An enhanced version of **Conceptstation** mechanical computer-aided engineering software has been announced by **Aries Technology, Inc.**

Release 2.0 of Conceptstation features solids modification; complex surface geometry design; form feature-based solids modeling; increased functionality in the design rule processor; communication of engineering concepts via annotation; an enhanced macro language; support of solid-surface information translation; and enhancements to the finite-element modeler.

The release is also compatible with Xenix System V and supports electronic mail under the Aries user interface.

The AT1200 version of the Conceptstation costs $25,500. The AT1100 and the CP1100 versions cost $21,850 each.

Aries, 65 Suffolk St., Lowell, Mass. 01854. 617-354-0900.

Applications packages

NCR Corp. has introduced two software packages designed to run on the Unix-based NCR Tower family of computers.

NCR Alis is an office automation package said to offer integrated compound-document capabilities allowing users to combine different information types with graphics.

NCR Smart is a modular OA system said to feature file compatibility between DOS and Unix versions that have file compatibility. It includes the Smart Word Processor with Spellchecker, the Smart Data Manager, the Smart Spreadsheet with Business Graphics and Smart Communications.

NCR Alis costs from $1,215 to $2,125 per user, and NCR Smart costs from $315 to $620 per user.

NCR, 1700 S. Patterson Blvd., Dayton, Ohio 45479. 513-445-4169.

Utilities

Version 2.2 of **Turbodisk** and **Turbodisk Plus** for Digital Equipment Corp. MicroVMS and VMS-based systems have been announced by **EEC Systems, Inc.**

Version 2.2 is said to feature the ability to shadow Turbodisk or Turbodisk Plus onto a file on any DEC VAX/VMS disk. Users may store volatile data on the random-access memory disk without concern for data loss due to power fluctuations or system crashes, the vendor said.

Turbodisk costs from $1,250 to $9,500. Turbodisk Plus costs from $2,000 to $2,500.

EEC, Millbrook Park, 327 E. Boston Post Road, Sudbury, Mass. 01776. 617-443-5106.

Development tools

Version 3.1 of **Art/Unix**, an expert system development tool that was designed to run under Unix on Sun Microsystems, Inc.'s Sun-3/100 and Sun-3/200 series workstations, was announced recently by **Inference Corp.**

New features of the product are said to include an incremental Save and Restore capability and support for a Disksave feature.

In addition, Inference's programming technology has been extended to provide users with built-in Help for writing their own code, according to the vendor.

The development version of Art/Unix 3.1 for the Sun systems costs $60,000.

Inference, 5300 W. Century Blvd., Los Angeles, Calif. 90045. 213-417-7997.

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MICRO BITS

Douglas Barney

Big Blue riding high

Back in the saddle again? Although some still debate the sales success of IBM's Personal System/2 line of micros, the Jolly Blue Giant appears to be back in control of the personal computer industry.

IBM is setting the pace for OS/2 and should be the first vendor to offer the operating system to customers. It also has clone makers scrambling to implement the new Micro Channel architecture bus so that all systems can run the more advanced Micro Channel boards that are surely on the way. And were it not for IBM, the 3½-in. floppy disk drive would have no chance of luring PC users away from the less-stable 5¼-in. floppies.

IBM may never rule the PC world with the same authority as it does the mainframe market, but it has become clear that when William Lowe speaks, the industry listens.

Need some new threads. As if Microsoft doesn't have its hands full cranking out OS/2, some are now pining for a multithreaded version of OS/2 that will tap the Micro Channel's ability to run multiple processors.

Continued on page 40

Cloners push speed at Comdex

Systems built on 286 and 386 debut from Maple, Acer, Delta, others

LAS VEGAS — Speed to burn was the theme for this year's Comdex/Fall '87, as a raft of systems based on Intel Corp.'s 80286 and 80386 chips were introduced.

Those systems included the following:

- The Maple 386 bowed from Maple Technology Corp. in Sunnyvale, Calif. It is based on 16- and 20-MHz versions of the 80386. The company said multiuser, multitasking performance is achieved with either The Software Link, Inc.'s PCMOS 386 or the Santa Cruz Operation's Xenix 386 operating system. System package prices range from $5,000 to $15,000.
- American Research Corp. released its 80386-based ARC 386, which it plans to market as a stand-alone workstation, as the file server in a local-area network (LAN) or as the hub of a multiuser system under the Xenix operating system. The system comes equipped with 2M bytes of internal memory and a 40M-byte hard disk. It supports IBM's Personal System/2-standard 3½-in. disks as well as 5¼-in. floppy disks. The ARC 386 costs $3,495.
- Acer Technologies Corp. in San Jose, Calif., introduced the Acer 1100/20, a 20-MHz version of its 80386-based computer. The unit offers 2M bytes of random-access memory (RAM). The Acer 1100/20 Model 340 features a 340M-byte hard disk drive, the Model 135 has a 135M-byte hard disk drive, and the Model 70 comes with a 70M-byte hard disk drive. A 5¼-in. floppy disk drive is standard, as is Microsoft Corp.'s Windows/386 operating environment. Prices are $6,695 for the Model 70, $7,995 for the Model 135 and $9,995 for the Model 340. All three models are scheduled for availability in the first quarter of next year.

Acer also announced the Acer 900, a 12-MHz IBM Personal Computer AT-compatible computer. Prices range from $3,095 for a monochrome model with a 40M-byte hard disk drive to $4,395 for a model with an enhanced graphics adapter (EGA) and a 70M-byte hard disk drive.

- Delta Computer Corp. unveiled its Executive series, which includes tower, desktop and workstation products targeted toward file-server applications. The 80286-based 12-MHz tower sells for $2,499, and the 80386-based 20 MHz is priced at $4,699.

Delta's desktop units, the President 286, which sells for $2,199, and the President 3270, which sells for $3,499, are available in 286-based and 3270 terminal formats.

The company's VP series is a line of high-performance workstations utilizing Intel's 8088 and 80286 processors. Prices are $899 and $2,199.

Also announced by Delta were two laptops. Both units

Continued on page 40

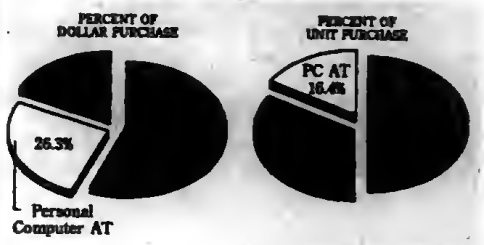
Inside

- Borland unveils version of Ansa Software's relational data base. Page 36.
- Austin offers series of battery-operated portables designed to withstand the outdoors. Page 44.
- Nantucket releases enhanced version of Clipper. Page 45.

Data View

IBM desktop systems

Store purchase by units and dollars for second-quarter 1987



INFORMATION PROVIDED BY IMS AMERICA

Transformer 2 extends PS/2 expandability

BY JAMES A. MARTIN
CW STAFF

HUNTINGTON BEACH, Calif. — Advanced Digital Corp. (ADC) has introduced an IBM Personal System/2 add-in board that reportedly enables PS/2 models based on IBM's Micro Channel architecture to use existing IBM Personal Computer enhancement boards via a PC bus expansion chassis and connecting cable.

The Transformer 2, which will sell for $695 when it is available next month, is said to offer PS/2 users the benefit of running their existing PC add-in cards as well as having additional expansion slots on the less-expandable Models 50, 60 and 80.

The Transformer 2 is installed in the PS/2 and is connected to a PC expansion chassis

Continued on page 36

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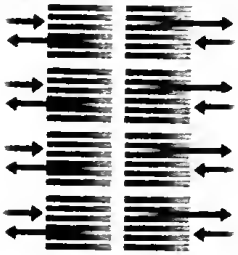
The VLX processors move transactions in 32-bit chunks. They reach into main memory in 64-bit chunks. Because this happens in parallel, more work gets done in less time at a lower cost per transaction.

THE SERVICE IS EASY.

All critical components are field replaceable. When service is required, it's faster. You don't even have to stop an operation to add or replace components.

THE DATA EXPRESSWAY.

In a conventional database, I/O requests must be handled sequentially. This creates queues that slow response time. In the VLX system, there are multiple paths to multiple disks. Data enters and leaves the database simultaneously. No time is wasted, and all disk space gets used.

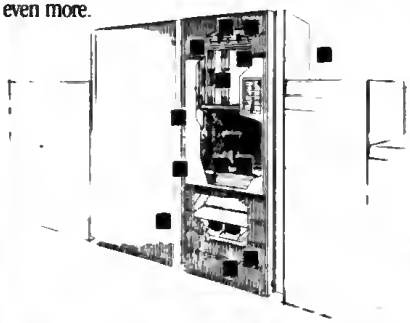


DIAGNOSTICS FROM A DISTANCE.

An integrated microprocessor allows us to monitor the system environment from anywhere in the world. We can even run stress tests remotely. If a failure does occur, the VLX has the capability to automatically dial out to remote centers anywhere in our worldwide network.

THE SYSTEM KNOWS THE SYMPTOMS.

Expert systems software, using fault analysis, directs the problem diagnosis systematically. It also allows us to analyze it and shorten service time even more.



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We offer software that will protect the security of your data whether it's in the VLX, in another Tandem system or in transmission.

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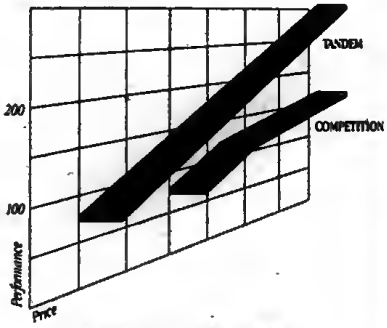

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The VLX is compatible with any Tandem system and with all major communications standards — SNA, X.25, MAP and O.S.I. And by acting as a gateway to other vendors' systems, the VLX can link them and enhance their value as well.

WE HAVE EXCELLENT REFERENCES.

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TANDEMCOMPUTERS

SMALL TALK

William Zachmann

Quattro's a knockout

One of the clear messages at Comdex/Fall '87 in Las Vegas recently was that 1988 promises to be the year of the "Battle of the Spreadsheets." Lotus's 1-2-3 has certainly been the undisputed heavyweight champion for the past few years. So far, none of the contenders of the recent past have come close.

Despite offering more functions and lower prices in varying combinations, challengers like Paperback Software's VP-Planner, Daybreak Technologies' Sylk and Javelin Software's Javelin haven't had an easy time of it. None of them have been knocked out in the early rounds, but none have been able to win rounds against the champ, either.

This year's Comdex/Fall marked the debut of two promising young heavyweights, however. Microsoft's Excel, the IBM-compatible brother to the product of the same name that knocked out Lotus's Jazz on the Apple Macintosh, is the best known contender. The graphics-based Excel could give 1-2-3 a serious challenge on the high end.

Nevertheless, I suspect that the roughest challenge may come from Borland International's Quattro — as in "1-2-3-quattro." Brainchild of Borland Chairman Philippe Kahn and developed by a team headed by

Continued on page 37

Gates traces languages from rags to riches

First in a three-part series by Bill Gates, chairman of Microsoft Corp., on the evolution of computer language technology.

Computer languages, like natural languages, evolve. With the help of standards committees and market pressures, they become more formal and often sprout new features and structures that allow better program design.

During the last several years, the environments around the languages have evolved, too, with the advent of integrated editors and debuggers designed to make programming easier. And as more enthusiasts have taken up programming and more professionals have entered the personal computer field, the market for languages has evolved.

What might have been perceived as a small, arcane and, perhaps, stodgy business a few years ago has turned into one of the most competitive and exciting markets, one with tremendous innovation. There are more people programming now than ever before because of the success of the low-end language market.

With the advent of the powerful Intel Corp. 80286 and 80386 microprocessors and the emergence of sophisticated operating systems such as Unix/Xenix and Microsoft's MS OS/2, languages appear poised for another evolutionary burst.

This burst will have a major impact on the industry, for as languages go, so go applications. The features and capabilities of languages help determine the speed, complexity and reliability

ROBERT BURROUGHS/GAMMA LIAISON

Bill Gates

of the products they are used to create. In addition, the market for language products continues to grow rapidly and has a bearing on the design of applications software.

Strategically, language technology is advancing on the following three broad fronts:

- Traditional computer languages will become integrated with macro languages found in applications.
- Traditional languages will evolve toward an ideal language.
- An integrated development environment will assist in software development.

In the broadest sense, there are two forms of computer languages. The first, traditional computer languages, was designed to tap system resources. Whether a businessman uses Basic, a mathematician solves equations in Fortran or a professional developer builds a new operating system in assembler and C, these individuals all use languages to reach low-level system resources in order to perform various functions and use various system devices.

Continued on page 41

College systems chief helped develop RT PC but now has doubts, sees it converging with PS/2

As a manager of systems development at Carnegie-Mellon University in Pittsburgh, Anthony Schaller is in an enviable position. His task is to keep the school on the leading edge, and resources are seldom a problem.

The University of Pittsburgh graduate recently spoke with *Computerworld* staff writer Alan J. Ryan about IBM's RT Personal Computer, reduced instruction set computing (RISC) and his MIS environment in an educational institution.

What kinds of systems are you using?

For administrative data processing, we support the needs using a cluster of DEC machines: an 8700 and three VAX-11/780s. We also have a couple of Microvaxes that support some of our development efforts as well. We also have an information system project that we're just bringing out of the development phase and have just put into deployment on an IBM 3083 mainframe. Our future direction is to move that system off the IBM and onto the VAX 8700.

The campus itself has a variety of hardware; it's really workstation computing that's been

Anthony Schaller

the direction for the academic side of the house. We can expect that in the future, faculty, staff and students will all have access to 32-bit virtual memory workstations. All the machines today are connected by a campus network that consists of a combination of IBM cabling, Ethernet and fiber-optic backup.

What are some projects you've worked on?

Carnegie-Mellon was assigned a joint research project with IBM back in '83 on the RT PC. The charter of that effort was to build a personal computing environment that would support a new type of user interface — a window-based interface with concurrent processing capability.

Continued on page 41

Lotus reinforces flanks in battle of graphics applications

Graphwriter II lets 1-2-3 users toggle between spreadsheet, charts; also works with Dbase

BY JULIE PITTA
CW STAFF

Lotus Development Corp.'s Graphwriter II should solidify the company's already strong base, appealing to 1-2-3 users who need to take spreadsheet information and organize it into charts and graphs.

According to Dataquest, Inc., 1.3 million graphics software products for microcomputers, including paint, draw and presentation graphics packages, were shipped last year. Dataquest predicts the figure will climb to 1.6 million in 1988.

In the market for software packages targeted at chart and graph applications, Lotus faces competition from Microsoft Corp.'s Chart and Ashton-Tate Corp.'s Chart-Master. Lotus also competes with smaller companies like Software Publishing Corp., which sells the $395 Harvard Graphics package, and Enertronics Research, Inc. in St. Louis, which offers its Energraphics package for $595.

Graphwriter II, a $495 upgrade of Lotus's Graphwriter package, was released last September. Bill Higgs, software industry analyst for Infocorp, said Graphwriter II will trade off Lotus's loyal 1-2-3 following, although the product also works with Ashton-Tate's Dbase.

Graphwriter II

Price: $495 ($75 to upgrade for current Graphwriter users)

- Choice of 34 chart types
- Up to 100 charts can be produced with one command
- Three-dimensional capabilities
- Requires 512K-byte of RAM, a hard disk drive, a graphics card and MS-DOS Package 2.0 or above

"The main incentive is the hooks to 1-2-3," Higgs explained. "If you're trying to compile repetitive reports such as spreadsheets with graphics supporting them, it's easy to go back and forth."

However, Higgs said, the program's user interface could prove an obstacle to its acceptance. "It's much more awkward to get the information into 1-2-3 than, say, with a package like Harvard Graphics, but once you're there, it's easier to use because of the strong coupling to 1-2-3. It's going to be a tough choice for the users."

Lotus users surveyed said Graphwriter II's user interface is an improvement over the earlier package. A number of them said they use Graphwriter II with Lotus's Freelance Plus, a drawing package that allows them to embellish Graphwriter II's charts.

"You hit a brick wall with the other packages like Chart-Master," said Bill Neuser, finance system executive for Chrysler Corp.'s financial presentations and systems department. "You hit a brick wall with what you can do on Graphwriter, too, but with Freelance you can change the shape of the graphs and charts and add more lines if you need to."

Dan Gralla, microcomputer manager for Kelt Oil & Gas in Los Angeles, said Graphwriter II allows him to work with both 1-2-3 and Dbase. "I was having a hard time finding a package that allows log-to-log graphs from both Dbase and 1-2-3 files," Gralla explained. "Graphwriter was the only one that I found that could do that."

Paradox 386 set to ship next month

BY STEPHEN JONES
CW STAFF

SCOTTS VALLEY, Calif. — Borland International recently unveiled Paradox 386, a new version of Ansa Software's relational data base that can use up to 16M bytes of memory, sources at the company said.

The $895 package, which was designed for Intel Corp. 80386-based microcomputers running Microsoft Corp's MS-DOS 3.0 or higher, is scheduled to begin shipping the second week of December.

Borland also said it plans to announce that it will bundle SQZ Plus, Turner Hall Publishing's popular spreadsheet data-compression program, with all releases of Quattro.

Paradox 386 uses an MS-DOS extender developed by Phar Lap Software, Inc. to break the 640K-byte memory barrier and take advantage of the 16M bytes of linear address space on 386-based machines, said Richard Schwartz, vice-president of software development for Ansa, which is a Borland subsidiary.

Schwartz claimed that Paradox 386 can carry out data base queries, sorting and reporting up to five times faster than its predecessor, Paradox 2.0. The increased performance is the result of the microprocessor's 32-bit instruction set, he said.

Paradox 386 is compatible with two earlier versions of Paradox, allowing users of all three releases to concurrently work on the same data table if they are hooked up to an MS-DOS-based network. A local-area network version of the package will be available in the first quarter of 1988, Schwartz said.

The increased power and memory of Paradox 386 is intended to make many MIS professionals less reliant on using minicomputers and mainframes to build sophisticated data base applications.

Don Smith, national coordinator for microcomputer consulting at Price Waterhouse & Co. in Chicago, said the potential for 16M bytes of memory makes Paradox 386 very attractive.

Although Borland is developing a version of Paradox for 286- and 386-based microcomputers running under Microsoft and IBM's OS/2, Schwartz said that the release for MS-DOS environments is not intended as a temporary offering.

Borland is betting that it can also win over customers for its $195 Quattro spreadsheet with the inclusion of SQZ Plus. A special version of SQZ Plus, priced at $99.95, was written for Quattro and comes fully integrated with the spreadsheet.

Transformer

FROM PAGE 35

with a cable and ADC's PC expansion interface board. The PC enhancement boards are installed in an ADC or other standard expansion chassis and are accessed by the Transformer 2, according to company officials.

"There are 12 million PCs and 50 million PC expansion cards out there, and they need to be used in the PS/2 Micro Channel market," said Hossein Asadi, president of ADC. "We see two markets out there: those looking for more PS/2 boards with more features and those with PS/2s that can't afford or don't want to buy a lot of additional boards, who want to use the PC boards they already have."

The Transformer 2 is said to be an interim product that will help bridge the gap between the two standards for some users.

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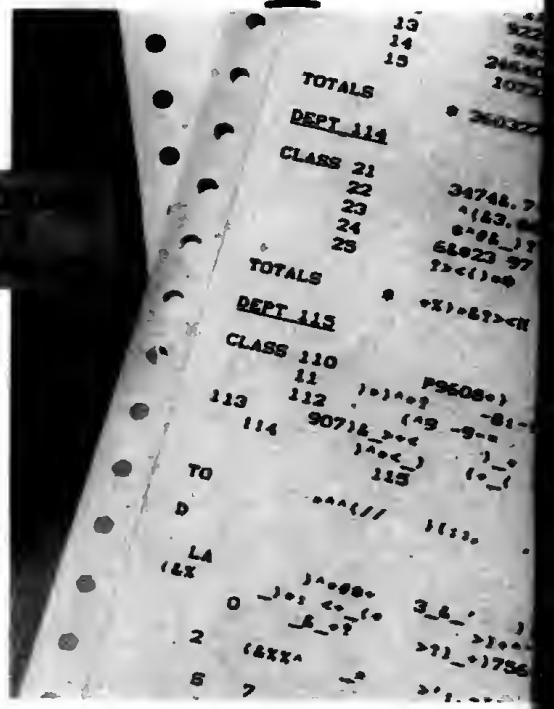

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Quattro

FROM PAGE 35

Analytica, Inc. founder Adam Bosworth, Quattro is a spectacular product. Priced at $195 with no copy protection, Quattro offers 1-2-3 compatibility with performance that leaves 1-2-3 in the dust. Quattro represents brilliant design and implementation and a tremendous value for the dollar.

Designed in a manner that is certain to give Lotus's lawyers migraine headaches, Quattro doesn't mimic the "look and feel" of 1-2-3. Quattro's primary user interface is very different from that of 1-2-3. Not just the screen layout but the entire menu structure of Quattro is no more similar to 1-2-3 than, say, Microsoft's Multiplan.

Quattro, however, was designed to permit users to customize the user interface to fit individual preferences. One way to tailor Quattro is to reproduce the menu structure of 1-2-3. Borland provides a user interface customization file that does exactly that.

In addition, Quattro can read and write a wide range of data and macro files. These include 1-2-3 and Lotus's Symphony work sheet files as well as Ashton-Tate's Dbase and Ansa's Paradox data base files. The bottom line is that Quattro offers a highly compatible alternative that experienced 1-2-3 users can start to use productively with virtually no training and no conversion.

Quattro, however, is more than just a non-copy-protected, less expensive, faster and compatible alternative to 1-2-3. Even in its 1-2-3 emulation menus, Quattro does the Lotus product one better. Besides running faster, Quattro offers additional options. For example, Quattro's 1-2-3 emulation offers six data base sort keys, compared with 1-2-3's three.

Quattro is also better in other areas. Its graphics capabilities include more graph styles than 1-2-3, Adobe Postscript support, variable type fonts, customization options and a number of other improvements. Quattro's presentation graphics output capabilities rival those that 1-2-3 can obtain only in conjunction with separate presentation graphics software. What's convenient is that these capabilities are all available within Quattro's integrated menu system.

Yet another area in which Quattro stands out is in providing a powerful macro facility that goes well beyond what 1-2-3 Version 2.0 offers. More functions, macro debugging capabilities, links to Borland's Turbo Pascal and Turbo C, macro recording and the ability to customize menus are among the Quattro enhancements.

Quattro also has built-in "books" for add-in enhancements of various sorts, such as Turner Hall's SQZ, which compresses spreadsheet files to minimize the disk space required for saved files.

With challengers like this, it's no wonder that Lotus has finally moved to drop copy protection. One can't help but wonder, however, whether the company's move will prove to be too little, too late.

For me, at least, Quattro has certainly become the character-oriented spreadsheet program of choice.

Zachmann is vice-president of research at International Data Corp.

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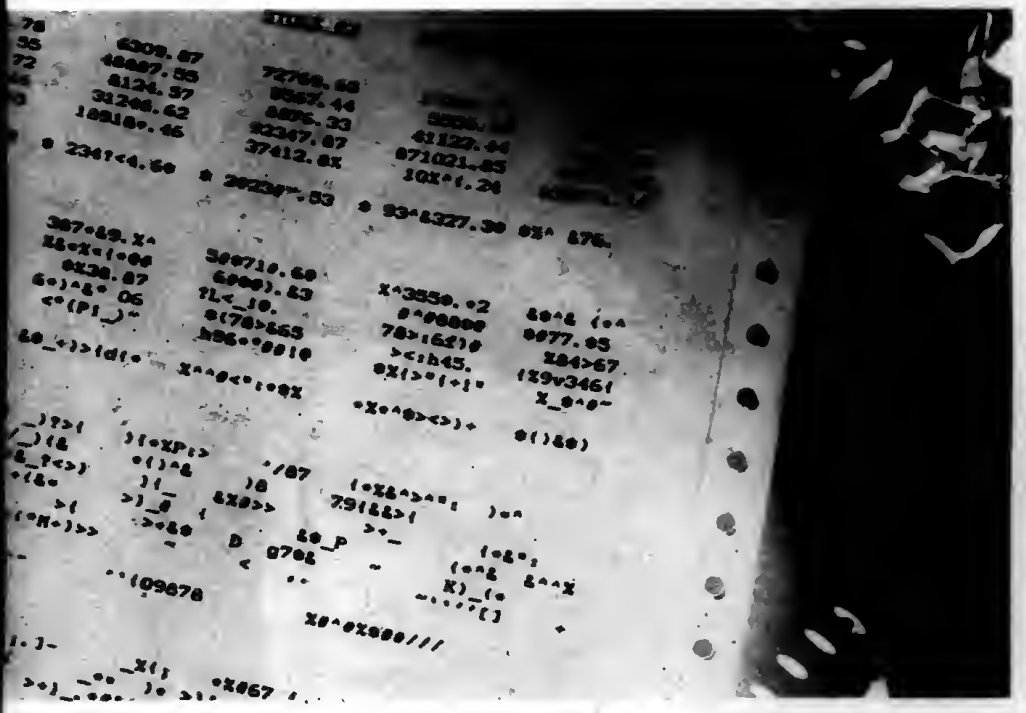

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CONTINUED FROM PAGE 33

Until such an operating system arrives, the Micro Channel is little more than a nice name for an incompatible bus.

I'll give you $50. Dac Software, a Texas-based accounting software upstart, has shipped more accounting modules than any other firm largely by selling a seven-module system that originally went for less than $50.

Now Dac has sold itself to Insilco Corp., a Fortune 500 firm that also owns Rolodex. But instead of $50, Insilco paid "considerably more than $18 million," a Dac official disclosed.

OS/2, oh no! MS-DOS extender products that allow applications to run in protected mode and tap into the large memory reserves of Intel 80286 and 80386 processors had a market opportunity as OS/2 development ran later and later. But with OS/2 due out this year from IBM, and with simple ported applications to follow soon after, the need for extender products may dissipate.

Go ahead. Clone my bus. For all the bold talk of cloners following the announcement of IBM's Micro Channel, there are still no clones announced or shipped. Sure, we have BIOS products announced from Phoenix Technologies, and some controllers from Western Digital are on the way. And IBM Video Graphics Array clones have also been pretty much taken care of. But we are still waiting for the bus; otherwise, we aren't going anywhere.

Interface Wars II. If you listen to Microsoft, the most important piece of OS/2 is the Presentation Manager graphical user interface. Microsoft applications will not move to OS/2 until the Presentation Manager is available, which should be at least six months after the operating system itself ships. Meanwhile, a multitude of vendors, including Lotus, will be hammering on users to buy character-mode OS/2 applications that don't require a mouse, IBM Enhanced Graphics Array boards and expensive monitors. Users will have to decide if they want applications to be pretty but late or just a bit better and soon.

DWIM wit. A product we wish were real was recently introduced by Automated Publication Systems in Auberry, Calif. Dubbed the DWIM key, for Do What I Mean, the red key with the adhesive back is meant to adorn the keyboards of frustrated micro users. When pressed, the device is supposed to connect the PC's random-access memory with the operator's brain and carry out instructions straight from the cerebrum. Maybe an Isuzu salesman should take care of this product's marketing.

Barney is a *Computerworld* senior editor, microcomputing.

Cloners

CONTINUED FROM PAGE 33

have 3½-in. microfloppy disk drive formats, with the Voyager I offering a 720K-byte capacity and Voyager II offering 1.44M bytes. Voyager I also has 16M bytes of RAM, expandable to 2M bytes, according to the company.

Both units feature blue LCD screens and 81-key keyboards. Both will accept an external 5¼-in. floppy drive or a hard disk drive.

• Blue Chip Electronics, Inc. in Chandler, Ariz., announced an 80286-based portable machine. The Master PC Portable, which weighs 19 lbs, will retail for $2,995. The unit features 1M byte of onboard memory and a 102-key PC AT-style keyboard with an LCD supertwist backlit display.

It operates at 12 MHz with a one-wait state or at 10 MHz with a zero-wait state, the company said.

It also includes five full-size, full-height expansion slots. Two 3½-in, 1.44M-byte floppy disk drives are included, and users have the option of converting one of the drives to a 3½-in. 20M-byte hard disk, the company said.

In other hardware news, Western Digital Corp. introduced its WD30-WDM, an Intel 8086-based motherboard said to be 100% compatible with IBM's PS/2 Model 30.

It contains a Paradise Systems, Inc. PVGA1 video graphics adapter, Western Digital's proprietary floppy and hard disk controllers, two serial ports and one parallel port.

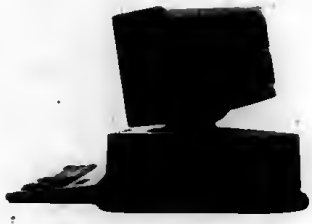
It also includes a keyboard port, mouse port, reset port and front-panel port. The board sells for $795.

Western Digital also announced the WD286-WDM2, an 80286-based, AT bus, single-board computer that features a 12.5-MHz, zero-wait-state design.

It contains a fully integrated EGA, floppy and hard disk controllers, two serial ports, one parallel port, a key-switch port and a mouse port. Its list price is $995.

In addition, the Information Equipment Division of Chinon America, Inc. in Los Angeles unveiled its high-density, 2M-byte, 3½-in. floppy drive for the PS/2, the PC AT and compatible computers.

The Model F-357L 3½-in. drive is a double-sided, high-density drive. It has 2M bytes of unformatted capacity, which has been formatted to 1.44M bytes to meet the IBM PS/2 standard. Sample unit pricing is $95.



How to get your PCs on speaking

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PC users never have to leave their PC application

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Your end-users wait for special requests to be processed. Then they perform the time-consuming task of re-keying data, inviting human error. And, even if your PCs are linked, end-users must leave their favorite PC programs to work with micro-mainframe links and mainframe query languages. Another stumbling block in the path of creating a smooth exchange of information.

The Application Connection® (T-A-C) from Lotus® is a mainframe and micro software product that lets you realize your investments in mainframe applications, micro-mainframe links and PC applications by connecting them for a fast, secure, uncomplicated exchange of information.

Gates

CONTINUED FROM PAGE 35

Thankfully, not too many people still argue over which language is the best; they now recognize that each language has its own strengths and weaknesses, its own proper use and its own constituency.

The most important thing we need now is for various languages to "talk" to one another. Thus, once programmers solve certain problems in one computer language, they would not need to rewrite the solution into every other language; they could call it from a system library. For example, most Microsoft languages can call each other. Other vendors are moving in the same direction by providing compatibility with standard calling conventions, such as those for C and Pascal.

Macro languages within applications programs is a second broad class of languages, although they are not normally viewed as such. The command language of Lotus Development Corp.'s 1-2-3 is a typical macro language. Data base applications also provide users with a macro language.

As traditional computer languages have become more structured and easier to use, so too have macros. On the simplest level, macros are used to chain together and automatically execute a series of commonly repeated commands, possibly including other macros.

Application macros differ from traditional languages in several respects. First, unlike programmers, who can choose from numerous languages according to their needs, users of an application have no choice about what macro language to use.

Second, each macro language differs — often radically — from the others. Third, macros created for one application cannot be used in another. Instead, users must create a separate set of macros for each application, even if many of them duplicate functions of existing macros in another application.

Fourth, there is no agreed-upon way for macros from one application to talk to macros from another.

Finally, macros cannot tap system resources or for traditional languages to tap macros inside applications.

For developers and end users, this wall leads to enormous duplication of effort. This is bad enough under a single-tasking operating system such as Microsoft's MS-DOS, but it will be intolerable under Microsoft and IBM's OS/2.

How, for example, will users be able to remember different sets of macro keystroke commands for several different applications when they are all run at once? And why should application routines be locked inside individual applications when OS/2 provides all the system-level resources needed to allow easy integration of, and fast communication between, applications or parts of applications?

Gates will attempt to answer these and other questions in the next issue of Computerworld.

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Systems chief

CONTINUED FROM PAGE 35

What do you think is the future of the RT PC?

I think the low-end RT and the Personal System/2 Model 80 are coming very close to converging, as far as processing power. The RT definitely was targeted as a high-end engineering system at first, and, from our standpoint, we wanted workstations that would be able to provide functions.

What is your view on RISC?

It offers the ability to do more scientific computing that could require many more instructions to operate more efficiently.

I guess the question I have is, Does it make a difference when it comes to graphics-oriented objects that are sitting out on the display when the processor is trying to keep track of what's out on display as well as other processes that are running on that same system? For us, anyway, RISC doesn't play as vital a role as it would for somebody that really has more of a need for that technology.

What would it mean for users to have RISC combined with the power of the Intel Corp. 80386?

That would be a pretty unique combination, if those principles could be adopted with that processor. That could be an effective and efficient programming environment to build faster applications.

How do you see workstations evolving?

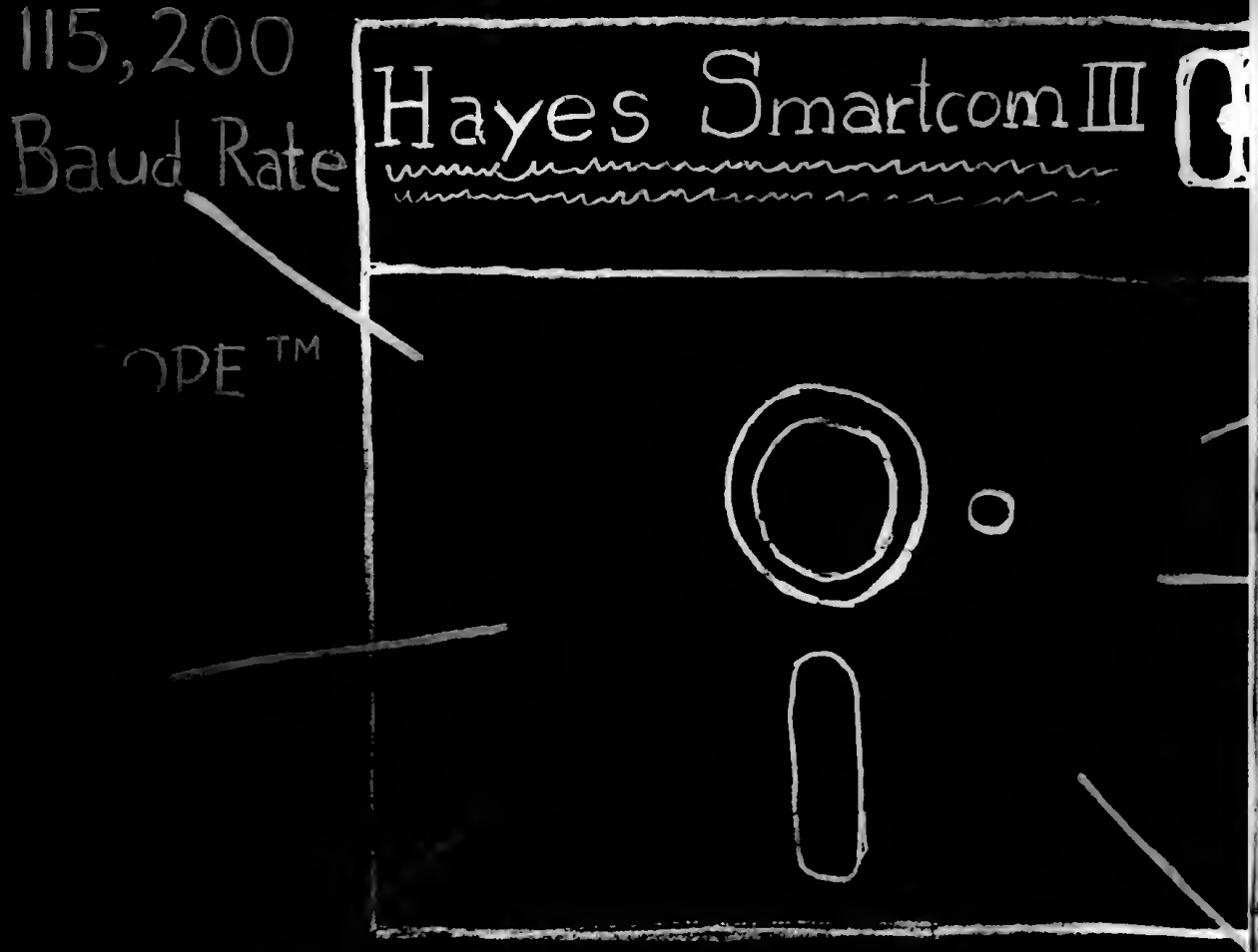
One thing we've determined here is that it is certainly possible to do parallel processes on workstations interconnected by a high-speed network. And you can gain some performance improvements by taking the results of one of those processes running on some other system and feeding them into another process.

What coming technologies are you interested in most?

I think that parallel processing is a concept which will revolutionize the industry with respect to being able to get more work done in a lesser amount of time.

Laser disk technology has come a long way, and that will provide some interesting alternatives for data archival and data storage. Workstations will also help the development cycle. We've been looking at that aspect of it, taking [computer-aided software engineering] tools and being able to generate from a systems design . . . and go through the generation process of data structures more quickly.

THIS TIME WE OUTSMARTED



EVEN OURSELVES.

Hayes

NEW PRODUCTS

Systems

The **Microscribe 600** series of battery-operated portable computers, designed to withstand rugged outdoor environments, has been announced by **Amlan, Inc.**

Each unit features an 8-line by 40-char. LCD with text and graphics modes, a built-in modem and either 128K or

Amlan's *Microscribe 600*

320K bytes of memory. It also features the CP/M operating system from Digital Research, Inc., a Basic interpreter and an Alps Ramdisk controller. Twin serial communications ports are provided as well as support for printers and a bar-code reader at rates to 9.6K bit/sec.

Microscribe 600 costs from $1,500.

Amlan, 97 Thornwood Road, Stamford, Conn. 06903. 203-322-1913.

Software applications packages

Reference Software has introduced four software volumes for its **Reference Set Library**, an information retrieval system of reference works.

The Reference Set Library is a line of word-oriented data bases. The four volumes include Reference Set 3.0, which is a two-volume set containing the Random House Concise Dictionary and The Reference Set Thesaurus; Stedman's Medical Dictionary; and Black's Law Dictionary.

The integrated packages run on IBM Personal Computers and compatibles. A 3½-in. disk version is available for IBM Personal System/2s.

Reference Set 3.0 costs $89 as a single unit or $69 each; Stedman's and Black's dictionaries cost $89 each or $49 each as add-ons to Reference Set 3.0.

Reference Software, Suite 131, 330 Townsend, San Francisco, Calif. 94107. 415-541-0222.

Software utilities

T-Z-Link, software designed to provide transfer of mainframe graphics to IBM Personal Computer systems, has been announced by **Eastern Computer Graphics, Inc.**

T-Z-Link allows images from mainframe business, engineering, scientific and computer-aided design graphics application programs to be imported to the Zeongraphics presentation graphics application package for editing.

T-Z-Link is compatible with such host-based graphics packages as RS-1, from BBN Software, Inc., and Chemex, from Chemical Design, Inc.

T-Z-Link costs $395.

Eastern Computer Graphics, 22 Meridian Road, Eatontown, N.J. 07724. 201-542-7733.

Development tools

MMC AD Systems has announced the **C Programmer's Toolbox Volume II** for the IBM Personal Computer and compatibles.

The revamp features three additional primary development tools said to enable a programmer to check C program syntax, check and trace symbol use and determine a program's critical path.

Also included in the product are tools providing file and data verification and filtering.

Volume I allows users to beautify C program listings, determine a program's function hierarchy and measure where program execution time is being spent.

The C Programmer's Toolbox Volume I and II cost $79.95 each or $130 together.

MMC AD Systems, Box 360845, Milpitas, Calif. 95035. 408-263-0781.

Software enhancements

Kopp Co. has introduced **Version 2.0** of its **Human Resources Management Software System**, designed for use on the IBM Personal System/2.

Enhancements include user-definable fields, the ability for the user to rename existing fields, the interaction of table and code screens, instantaneous update of tables and codes and the addition of standard savings plan information fields, according to the vendor.

The system consists of three modules: the main module, which costs $1,500; the Expanded Main module, which costs $4,500; and the Applicant Tracking module, which costs $2,000.

Kopp, Suite 300, Summit Two, 4700 Rockside Road, Cleveland, Ohio 44131. 216-642-4656.

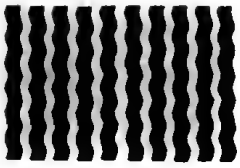
Board-level devices

A small computer systems interface (SCSI) version of its Xenix 386 software driver has been announced by **Future Domain Corp.**

VaporCASE

VaporCASE

The wishful promises of vendors who are trying to jump on the CASE bandwagon. They demonstrate part of the CASE solution, and hope you'll wait until they develop the rest of their system which they promise will be ready "any day now." Meanwhile, even if they could help you develop a brilliant applications strategy, you have no clear way to implement it.



Piece Parts

Some CASE suppliers offer a small piece or two of the puzzle. A front-end here. A back-end there. Integration? No problem! Just as soon as they can make Company A's front-end work with Company B's repository, and tie everything into Company C's code generators.

Projections

One way to evaluate a CASE system is to simply visit the installations where the product is up and running. Most CASE vendors will tell you where their product might be installed in the future...if you don't mind waiting.

Called the **Model FDU-XEN**, the Xenix driver and utility package allow SCSI interfacing between Intel Corp. 80386-based personal computers and embedded SCSI peripherals. Features include multipath I/O, flexible interrupt reassignment, automatic retry and error correction. The driver works with the vendor's TMC-830 host adapter and TMC-870 combined floppy controller and host adapter. It supports Santa Cruz Operation's Xenix 386 System V Release 2.2.

Kits including a host adapter, a cable, software and manuals are priced from $289. A single 386 driver costs $99.

Future Domain, Suite A, 1582 Pkwy. Loop, Tustin, Calif. 92680. 714-259-0400.

NEW AT COMDEX/FALL '87

Nantucket Corp. released the **Summer '87** version of its **Clipper** data base language compiler.

The enhanced software is said to operate up to five times faster than the previous version. It costs $695. Nantucket, Suite 300, 12555 W. Jefferson, Los Angeles, Calif. 90066. 213-390-7923.

Metier Management Systems introduced a runtime version of its **Artemis 2000** fourth-generation language and relational data base management system for project-management application development.

The Artemis runtime module costs $1,000. Artemis 2000 Version 2.5 costs $5,000. Metier, Suite 1300, 2900 N. Loop W., Houston, Texas 77092. 713-956-7511.

Tatung Company of America, Inc. added **Platinum Card**, an enhanced IBM Video Graphics Array (VGA) card, to its line of graphics cards.

The card is compatible with IBM Personal Computers and compatibles. It offers 17 VGA modes and a palette of 262,144 colors when used with multifrequency and IBM Personal System/2 analog monitors. It costs $449.

Tatung also announced the **MM-1295W**, a 12-in. monochrome monitor featuring 800- by 560-pixel resolution. It costs $295. Tatung, 2850 El Presidio St., Long Beach, Calif. 90810. 213-979-7055.

The **IS-300F** flatbed scanner, designed for use with IBM PCs or Apple Computer, Inc. Macintosh computers, was introduced by **Laser Connection**.

The scanner is said to be compatible with the Canon U.S.A., Inc. **IX-12F**. It scans text at up to 300 dot/in. resolution. It costs $1,495. Laser Connection, 7852 Schillinger Park W., Mobile, Ala. 36608. 205-633-7223.

Renaissance GRX, Inc. announced a tool kit for developing personal computer graphics applications.

Called the **Renaissance Graphics Device Interface Developer's Kit**, the package includes a graphics controller, a user's guide, a reference manual, development software, utilities and fonts. It costs $695. Renaissance GRX, Cedar Park, 2265 116th Ave. N.E., Bellevue, Wash. 98004. 206-454-8086.

Sigma Designs, Inc. introduced four versions of its **Laserview** high-resolution display system.

The Laserview system is now available for PS/2s and Macintosh IIs. All versions feature 1,664- by 1,200-pixel resolution on a 19-in. paper-white screen. The Macintosh SE version costs $2,295. All other versions cost $2,395. Sigma Designs, 46501 Landing Pkwy., Fremont, Calif. 94538. 415-770-0100.

Macgenius, a 15-in. full-page display monitor for use with the Macintosh 512, Plus and SE, was introduced by **Micro Display Systems, Inc.**

Macgenius features black-on-white page displays and text and graphics in noninterlaced monochrome portrait format. It costs $1,795. Micro Display Systems, P.O. Box 455, 1310 Vermillion St., Hastings, Minn. 55033. 612-437-2233.

Executek Products, Inc. announced a full-featured office automation processor card called **Cris** that was designed for use with IBM PCs.

Cris features digital dictating, word processing, a client data base, a calendar, a security modem, automatic dialing and file management as well as electronic mailbox capabilities. It costs $895. Executek, Suite 101, 23505 Crenshaw Blvd., Torrance, Calif. 90505. 213-530-2755.

Skok Systems, Inc. released four computer-aided design (CAD) software products.

Drawbase HLR is a stand-alone program that removes hidden lines from any view created with the three-dimensional component of Skok's Drawbase. It costs $495.

Drawbase 2000 is a fully functional two-dimensional CAD program priced at $1,995.

Drawbase 3000 is a 2-D drafting and 3-D design CAD program priced at $2,995. **Drawbase 4000**, an integrated program including 2-D drafting and data base management, costs $3,995. Skok, 222 Third St., Cambridge, Mass. 02142. 617-868-6003.

Skyscan, a hand-held image scanner for IBM PCs, PC XTs, and ATs as well as PS/2 Model 30s and compatibles, was introduced by **Skyworld Technology, Ltd.**

Skyscan can scan pictures in black-and-white or in three half-tone modes, with 16 levels of gray scale. It scans up to 4.2 in. wide with resolution selectable to 200 dot/in. Skyscan costs $495. Skyworld Technology, U.S. Liaison Office, 1772 Lark Lane, Sunnyvale, Calif. 94087. 408-446-9392.

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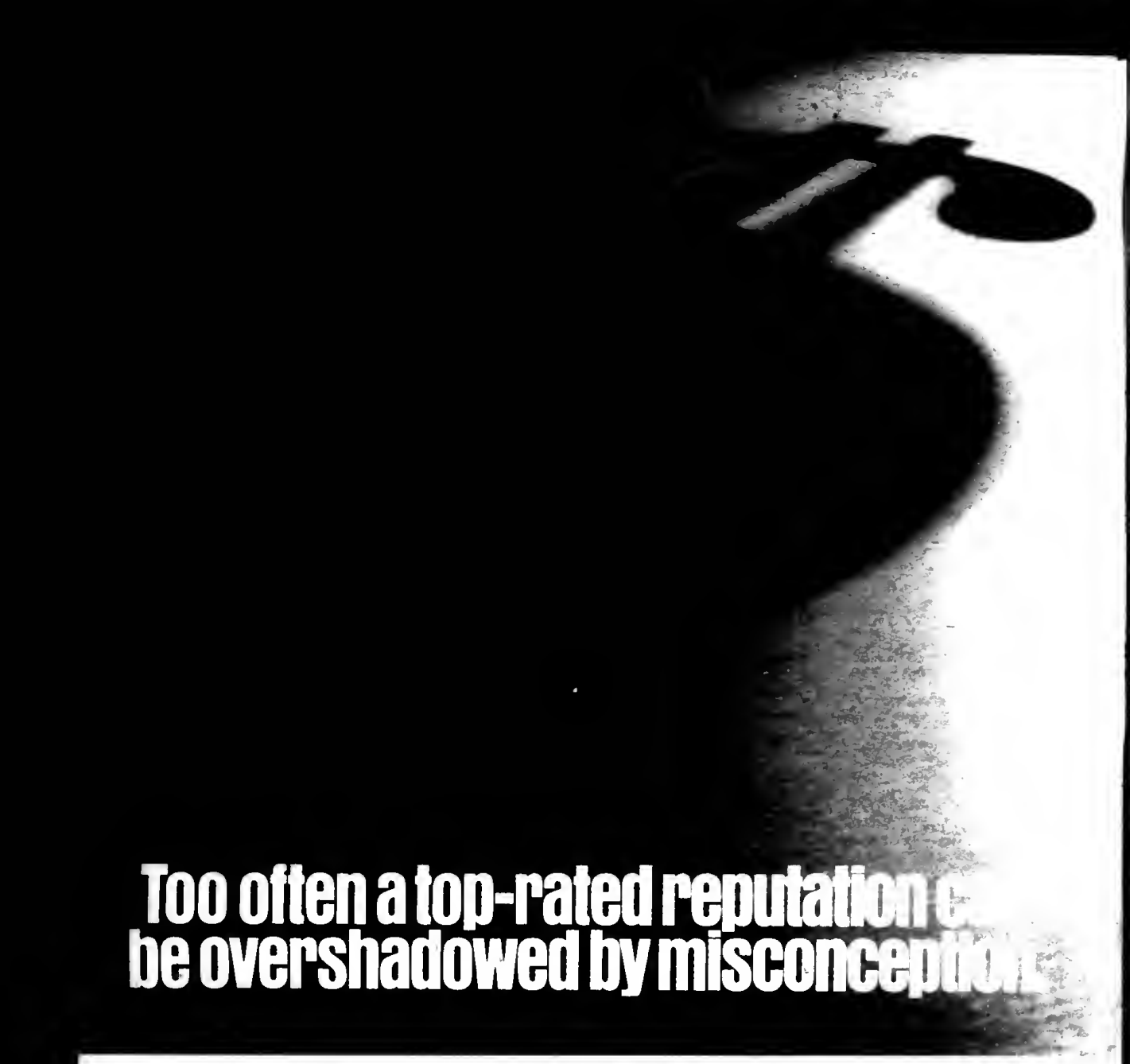

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35 Dir. Mgr. Supvr. OA/WP
38 Data Comm. Network/Systems Mgt

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12 Vice President, Asst. VP
13 Treasurer, Controller, Financial Officer
41 Engineering, Scientific R&D, Tech. Mgt
51 Sales/Mktg. Mgt

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C Microcomputers/Desktops
D Communications Systems
E Office Automation Systems
F No Computer Involvement

338746-1

DATA STREAM

Kathryn Korostoff

Changing the channel

The inclusion of a new channel-extension product among IBM's many June 16 announcements helped raise user and industry awareness of the technology.

For years, channel extension has been leading an unglamorous life, languishing all but unnoticed in the shadow of much sexier data communications technologies. But as the need for speed grows, the term "channel extender" is now being tossed around as befitting one of the hotter industry buzzwords.

There are several ways to differentiate products that fall under the channel-extension umbrella.

First, while some channel-extension products can use T1 or other facilities for long-distance transmission, others can only connect hosts for distances of up to a few miles. For example, IBM's 3044 extends the channel from the host up to 6,600 feet. IBM's recently announced 3737 uses public or private T1 links for much greater distances.

A second way to evaluate channel extension products is by

Continued on page 56

IBM details OS/2 server plans

Without IBM support, will developers write to LAN Manager APIs?

BY PATRICIA KEEFE
CW STAFF

ANALYSIS

IBM's recent announcement of an internally developed network file server is one of those good news/bad news situations for users.

Users now know exactly what IBM's OS/2 server plans are. An internally developed product, the IBM PC LAN Server, will incorporate the redirector, server code and some undefined software from Microsoft Corp.'s OS/2 file server, LAN Manager.

The LAN Server and its required OS/2 Extended Edition Version 1.1 both remain vaporware for yet another year.

Possibly of more interest to users is how IBM's announcement impacts developers. Users still do not know whether developers will write to the LAN Manager's Application-Programming Interfaces (API), particularly Named Pipes and Mail Slots.

"We do not plan to introduce any APIs to Version 1.0 of the OS/2 LAN Server in 1988," said Michael O'Dell, an IBM product manager for LAN System Products, in a recent interview. He also commented that IBM might provide similar capabilities via a different approach in 1989. This has to set a note of caution for developers looking at LAN Manager.

The industry consensus is that some developers will wait for IBM, some will go ahead and write to the LAN Manager APIs and still others may write their own proprietary APIs. The latter approach can cause problems if applications utilizing different APIs try to talk to each other, notes Thomas White, president of Infonetics, a Santa Clara, Calif.-based consulting group. Who will take which route remains under wraps.

Continued on page 54

Data View

TCP/IP users look ahead to Open Systems Interconnect

Based on a survey of more than 100 firms, 37% plan to migrate to OSI while 80% plan increased use of TCP/IP*

* Transmission Control Protocol/Internet Protocol

INFORMATION PROVIDED BY NEWTON-EVANS RESEARCH CO.
CW CHART

A campus net-mare

BY PATRICIA KEEFE
CW STAFF

PHILADELPHIA — Flexibility and careful planning were the key to tying together the "chaotic nightmare" composed of disparate parts of the 115-building campus of the University of Pennsylvania (UP).

Faced with linking together 85 Digital Equipment Corp. VAXs running VMS and approximately 100 Unix-based VAXs in addition to a menagerie of other equipment from IBM, AT&T, Hewlett-Packard Co. and Prime Computer, Inc. — as well as a

Continued on page 54

Waterloo adds PS/2 support

BY PATRICIA KEEFE
CW STAFF

NORCROSS, Ga. — Waterloo Microsystems, Inc. recently enhanced its Port network operating system to provide fault tolerance and protected-mode support for some models of IBM's Personal System/2.

In a recent product blitz, Waterloo also announced electronic mail, an IBM Systems Network Architecture (SNA) server, broadband support and an Arcnet card for PS/2s.

Version 2.41 of the Port PC LAN Program provides protected-mode support for IBM Personal Computer ATs, PC AT compatibles and PS/2 Models 50 and 60.

Port 2.41 also uses the extended memory of protected mode to run more concurrent tasks at the workstation while leaving the first 640K bytes of PC random-access memory for Microsoft Corp. MS-DOS applications, Waterloo claimed.

Continued on page 56

Inside

- Firms race to port SAA across multiple environments. Page 50.
- Vendors adding LAN bridges. Page 51.
- Torus adds network interface card. Page 57.

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The mainframe compiler uses standard IBM linkage conventions. Assembler programs, MAIN routines in other high-level languages, and packages such as IBM's ISPF and GDDM can be invoked directly from C.

And you can use C, instead of assembler, to develop small and fast subroutines called from other languages.

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Firm spreading SAA to the masses

BY ELISABETH HORWITT
CW STAFF

MALVERN, Pa. — Software products from Rabbit Software Corp. will provide application developers and board vendors with a smooth migration path to IBM's Systems Application Architecture (SAA) communications functions, the vendor claimed recently.

"With SAA, IBM for the first time has mandated a common interface" across different computing and connectivity offerings, instead of forcing developers to rewrite an application for each environment, said Charles Pitcher, Rabbit's director of product planning.

The software vendor is in the process of adding the SAA interface to those of its existing IBM Systems Network Architecture (SNA) products that come under the SAA umbrella. SAA versions of 3270, 3770, PU2.1 and LU6.2 protocols are scheduled to ship in the third quarter of 1988, Rabbit said.

Rabbit also announced plans to provide implementations of SAA products that IBM has not yet announced and may never directly support, according to Pitcher. For example, the software vendor will port Advanced Program-to-Program Communications/LU6.2 software to Microsoft Corp.'s LAN Manager and will also port its SNA products to Microsoft's OS/2 operating system for IBM's Personal System/2.

Rabbit is developing a hardware-independent version of IBM's Communications Manager, which will allow PS/2 board manufacturers to interface directly to various types of SNA connections on an OS/2 system without having to rewrite their software, Pitcher said.

Rabbit plans to have its OS/2-based products support DIA and Systems Network Architecture Distributed Services, or SNADS, two protocols that IBM has yet to implement on the operating system, Pitcher claimed.

All of the above introductions are scheduled for July 1988 availability, Rabbit said. An OS/2 implementation of IBM's Distributed Data Manager will be available at an unspecified date.

3Com welds TCP/IP link

BY PATRICIA KEEFE
CW STAFF

SANTA CLARA, Calif. — 3Com Corp. recently provided users of its 3+ network operating system with access to the Transmission Control Protocol/Internet Protocol (TCP/IP) internetworking protocol.

This will enable 3Com work groups to communicate with TCP/IP-based hosts.

Users can also simultaneously communicate with servers from 3Com and its Bridge Communications, Inc. division, 3Com said.

3+TCP/IP requires 3Com's Personal Communications Server/1 (PCS/1), an intelligent Ethernet adapter for IBM Personal Computers and compatibles. Available this month, the turnkey package costs $1,195.

Network workstations equipped with PCS/1 and 3+TCP/IP reportedly can perform direct file transfers between TCP/IP host computers and a 3+ file server. These workstations can also act as terminals to the host, also accessing the host via a Bridge server.

In addition to on-board TCP/IP support, the PCS/1 incorporates Telnet TCP/IP terminal emulation, file transfer protocol and network management functions, freeing memory in the PC for other tasks.

3Com claimed the PCS/1 supports all industry-standard TCP/IP applications, including TCP/IP's File Transfer Protocol, Bridge's DEC VT100 and IBM 3270 terminal emulation software, Bridge Application Programmatic Interface-compatible products and third-party terminal emulation packages.

Trio cutting the ribbon on LAN bridges

Microcom, Infotron, Lanex connections let separate nets communicate

BY ELISABETH HORWITT
CW STAFF

Several vendors are bringing to market bridges that allow nodes on separate local-area networks (LAN) to communicate over a variety of long-distance links.

At Comdex/Fall '87, Microcom, Inc. in Norwood, Mass., unveiled the Microcom LAN Bridge family of products said to connect IEEE 802.3 Ethernet or IEEE 802.5 token-ring LANs over leased or dial-up lines.

The bridges are built around modems that incorporate the Microcom Networking Protocol, or MNP, a de facto industry standard for error correction. The modem's data compression feature is said to provide high-speed data transmission over a dial-up LAN-to-LAN connection.

The Microcom LAN Bridge is a communications processor that includes the Wide-Area Network Module, which links to the telephone line; the LAN Interface Module; and the Bridge Management Module, which controls and monitors traffic over the LAN and the long-distance link.

The bridge is available in three models. The MLB/2000, which operates at 56K bit/sec., is priced at $7,499. The MLB/2500 is priced at $8,999. Both products are scheduled for release early next year. The MLB/1000 supports link speeds of up to 19.2K bit/sec., is priced at $5,499 and is scheduled to ship in January.

Localnet introductions

At last week's Localnet '87 conference in Los Angeles, Infotron Systems Corp. in Cherry Hill, N.J., introduced the LAN Span bridge, which reportedly links Ethernet 802.3 networks over synchronous long-distance links.

LAN Span is said to support V.35, RS-499, T1 and CEPT links at speeds ranging from 56K to 2M bit/sec. The connections can be made over leased or dial-up lines, satellite or microwave links, the vendor claimed. Priced at $9,995, LAN Span is scheduled for delivery in March.

Beltsville, Md.-based Lanex Corp. announced at Localnet the Mac Layer Bridge or Mac8023, which can connect Ethernet 802.3 LANs across backbones of baseband, broadband or fiber-optic cable, the company said. The product will be available immediately at a price of $3,995, Lanex said.

Protocol support

All three vendors' bridge products operate at the data link layer, allowing them to provide transparent pass-through of a variety of networking protocols, such as Digital Equipment Corp.'s Decnet, Transmission Control Protocol/Internet Protocol (TCP/IP) and Novell, Inc.'s Netware network operating system.

Lanex announced several other products at Localnet, including the following:

- The Broadband Transceiver, which reportedly links Ethernet-compatible devices to a broadband LAN. Priced at $595, the product is transparent to all 802.3 Ethernet Controller hardware and software.
- TCP/IP and IBM Netbios software for Lanex broadband networking products was offered in conjunction with Excelan, Inc.

The packages support personal computers running Microsoft Corp.'s Xenix or MS-DOS, DECs Microvax and DEC VAXs running either VMS or AT&T's Unix System V. Prices range from $1,300 to $4,000, depending on quantity.

- The Lanex PC Interface, an intelligent interface board said to allow PCs to exchange files or initiate terminal sessions over a broadband LAN. The product also allows PCs to share printers or hard disks over a Netbios interface. It is available immediately for $632 in quantities of 50 to 249.

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Campus net-mare

CONTINUED FROM PAGE 49

mix of local-area networks, word processing packages and equipment purchased by individual departments — Mark Fey, university program manager for the data communications and computer service, launched a plan aimed at solving most of these problems by year's end.

Beginning in January, for three months Fey and his compatriots evaluated "all known" Transmission Control Protocol/Internet Protocol (TCP/IP)-based products, both hardware- and software-based connection products for VMS. A final evaluation was published on the Internet bulletin board June 2. The final solution lies in a combination of well-defined and accepted standards enabling users to take advantage of campuswide resources, no matter what their equipment.

At the core of what is known as the Penn Net network is AT&T's Information Systems Network (ISN), newly installed in June.

"We do have the largest ISN installation in the world, incorporating 2.5 million feet of fiber-optic cable beneath the sidewalks of West Philadelphia," Fey said. "The ISN has more than enough switching capacity to take us into the [next] century."

A second key to Penn Net is standardization on TCP/IP — specifically, The Wollongong Group's WINS Release VX3.0 software. UP also uses, to a lesser degree, TCP/IP hardware from Excelan, Inc. and Ungermann-Bass, Inc.

The university is in the process of implementing a four-phase connection strategy focusing on broadly applicable connectivity standards, Fey said:

- Type 0 — Asynchronous RS-232 connection with speeds up to 9.6K bit/sec. for all ANSI terminals.
- Type 1 — Ethernet connectivity with Telnet. The school has purchased software under volume-pricing and site-licensing agreements for users who have their software loaded on any of 83 VMS-based VAXs.
- Type 2 — Similar to Type 1, but with Netbios capability for personal computer users on networks. The school has a site-licensing and volume-pricing agreement with Ungermann-Bass for its PC-based Ethernet TCP/IP software that also incorporates Netbios.
- Type 3 — IBM 3270 emulation across asynchronous and Ethernet networks. Plans were to complete the initial pass of Type 1 connection capability by mid-October while working in parallel on Type 2 connectivity, providing general availability by mid- to late November.

A vendor who "decommitted" threw a wrench into the delivery schedule for Type 3, Fey said. A network vendor failed to develop as promised an Ethernet value-added processor for an IBM 3274 controller in the TCP/IP world, forcing the university to redo the previously arranged groundwork while looking for a new supplier. "The name of the game in all books today is compatibility between machines," Fey said, noting that even IBM has come around to this way of thinking.

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Server plans

CONTINUED FROM PAGE 49

The response so far from Microsoft and 3Com Corp. officials to IBM's positioning on APIs has been to downplay the importance of the LAN Manager APIs while hinting or strongly implying — depending on whom you are talking to — that IBM will eventually announce support for those APIs.

"Don't you think we know what IBM is doing?" one Microsoft official exclaims.

Besides, the truly important APIs, we are told, are the 250 APIs incorporated into the OS/2 operating system. Microsoft further suggested that only specialized applications would take advantage of LAN Manager APIs.

That's an interesting position, since Named Pipes, for example, was touted at its announcement as key to the LAN Manager's positioning as *the* platform for distributed applications.

Also, a source who spoke with Steven Ballmer, Microsoft's vice-president of systems software, said Ballmer characterized the LAN Manager APIs as very important, adding that he believed developers will write to those APIs regardless of IBM's plans.

Either the LAN Manager APIs provide important capabilities to software developers or they don't. Since Microsoft doesn't seem very clear on this point, it's doubtful that developers could be.

Another difference between the LAN Server and the LAN Manager could affect developers. Only the LAN Server will be able to utilize the Communications Manager of OS/2 Extended 1.1.

And if IBM chooses to provide an alternative route for developers to take, an added issue becomes how difficult it will be for developers to write to both LAN Manager APIs and the IBM version.

"Will developers have to write three applications — one for OS/2 stand-alone, one for the OS/2 LAN Manager and another for OS/2 LAN Server?" asks Craig Burton, Novell's senior vice-president of corporate planning and development.

Microsoft claims support for LAN Manager APIs is a minor porting job. One official recently suggested that Microsoft might provide a way for developers to support both LAN Manager APIs and whatever IBM does in that area. Another area of concern to users interested in LAN Manager has to be the breadth of industry support for that product.

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Changing

CONTINUED FROM PAGE 49

determining whether they connect the host to a second computer or to a group of high-speed peripherals, such as laser printers or hard disk drives.

To date, the most popular application has been for host-to-peripheral channel extension. In this case, the user saves the cost of an extra CPU at a remote site by allowing the host at a main site to have access to and from a printer, storage device or terminal at the remote site.

Users have several options to consider when choosing a channel-extension product. Does the product require host-based software? How much control can a remote operator have? Can multiple hosts be connected? How many and what type of peripherals can be supported?

Paying the price

Channel-extension products are not inexpensive. And remember, you need a box at each end of whatever is being connected. If you are connecting a host to a remote tape drive, you have one end of the channel extension at the host and the other at the tape drive site.

Another example is Network Systems Corp.'s RDS product, which costs around $100,000 for both ends of a long-distance setup. For a local application, the cost would be $50,000.

Computerm sells different models of its Series/1. One configuration, the Model II, connects two hosts to one IBM 3890 document processor, one IBM 3272 or 3274 controller, one IBM printer and one magnetic tape drive over 56K bit/sec. lines. This configuration costs $48,000 for the host side and $44,000 for the remote side. Computerm also offers leasing as an alternative to purchasing the equipment.

Improving the odds

So why all the interest in channel extension? Many users choose channel extension for building disaster recovery sites. By having a remote host or storage device at a separate site, the potential disaster that could result from a host failure is minimized. To many companies, such as banks and insurance companies, any downtime on a host and any loss of data can be devastating.

Another driving force behind demand for channel extension is the soaring cost of real estate in cities. Many companies are moving their data centers to lower cost facilities. For example, some New York banks have data centers in New Jersey. Using channel extension, a host could be located in New Jersey while terminals accessing it from New York would appear to be local.

Adding to the impetus behind demand for channel extension products is the declining cost of T1 lines. Products like the IBM 3737 utilize T1 as their long-distance transmission method. As T1 costs continue to fall, users will more easily be able to justify the expense of T1 lines for data transmission of any kind.

Korostoff is a senior market analyst with International Data Corp. in Framingham, Mass., covering packet switching, data private branch exchanges, matrix switches, network management and channel extension.

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Waterloo

CONTINUED FROM PAGE 49

Available next month, Port 2.41 costs $2,495.

Waterloo also unveiled a broadband version of its Backbone Internet Gateway software. Port users can use a broadband network as a backbone to connect Port networks, Waterloo said.

Available in February, a starter kit for the broadband gateway costs $2,595. The Expansion Kit costs $1,495.

The Port SNA Server enables PCs located on a Port network to communicate with an IBM mainframe via an SNA/Synchronous Data Link Control communications link at speeds of up to 19.2K bit/sec., Waterloo said. The server supports up to 32 concurrent mainframe sessions, provides IBM 3274 (51C) controller and IBM 3278 and 3279 Model 2 or 2A terminal emulation. Depending on logical units served, the price ranges from $3,100 to $5,500, with upgrades ranging from $1,700 to $2,050.

Port Internet Mail (PIM) is a corporatewide mail system said to allow messages to be sent within a Port network, between a Port network and remote PCs and among Port networks linked by Port gateways.

Features include postal metaphors; automatic delivery scheduling; the ability to redirect mail among networks; message attachments up to 4G bytes; user-access restrictions; and carbon copies and registered mail. PIM is slated to be available next month for $795.

The Port Network Interface Card/A is an Arcnet card for the PS/2 that supports Allen-Bradley Co.'a VistaLAN/PC Network Interface Module. It will cost $749; delivery is scheduled for next month.

In September, Waterloo introduced security and network management software designed to facilitate communications via CCITT X.25 across a global communications system of interconnected local-area networks based on its Port software.

The new software incorporates the vendor's Internet Gateway Control Program, which reportedly provides centralized management, visitor IDs, gateway interfaces and backbone networking interfaces.

NEW PRODUCTS

Local-area network hardware

A network interface card called the **Ethernet Plus** adapter has been announced by **Torus Systems Ltd.**

The adapter features a personal computer-shared dual-ported 8K-byte memory buffer. It meets Ethernet and IEEE 802.3 standards and connects to both thin and standard Ethernet networks. It transfers data at 10M bit/sec. and works with IBM Personal Computers and compatibles with clock speeds ranging from 4.77 to 16MHz. It also has a jumper-selectable I/O port-base address and a software-selectable shared-memory base address.

The Ethernet Plus adapter costs $395.

Torus, 240 B Twin Dolphin Drive, Redwood City, Calif. 94065. 415-594-9336.

The **Bitstream Processing System 128** (BPS/128), a communications processing platform for use in the building of network products, has been announced by **Telestream Corp.**

The BPS/128 is a parallel computer that provides 1.28G bit/sec. of data throughput and up to 160 million instructions per second of bit-stream processing power, the vendor said. It can be used for designing application-specific software and hardware to implement network products such as protocol and format converters, multiplexers, cross-connect systems and ISDN gateways. Resources are managed by the vendor's TeleOS operating system.

Pricing ranges from $15,000 to $50,000. The BPS/128 Development System for designing, coding, testing and integrating software for the BPS/128 costs from $40,000 to $50,000.

Telestream, 1330 Charleston Road, Mountain Veiw, Calif. 94043. 415-968-7977.

Local-area network software

Ncompass Software, Inc. has upgraded its **Lanscape** work group software, which was designed to enable users of such networks as Novell, Inc.'s Netware, AT&T's Starlan and 3Com Corp.'s 3+ to share information.

Enhancements include dynamic multiserver linking, which allows users to store information across multiple, dynamically linked servers; user-sensitive storage, which enables users to select private or shared storage locations; document preview, which allows users to display the contents of a selected document without loading its parent program; electronic mail linkage, featuring automatic attachment of found documentation to transport packages; access to documents and programs residing on user workstations; and extended management report generation.

Lanscape costs $995.

Ncompass, Suite 702, 270 Lafayette St., New York, N.Y. 10012. 212-925-0020.

Customer-premise equipment

Data Switch Corp. has enhanced its **Galaxy-Plus** distributed communications matrix switch to support up to 4,096 nonblocked ports.

Galaxy-Plus incorporates performance monitoring capabilities and offers the option of integrated fiber-optic port-group extension, enabling users to locate communications equipment at distances more than 1,000 ft from a satellite switch cabinet.

A Galaxy-Plus aystem with 4,096 ports, including 16 lines of performance-measurement capability, costs about $335 per port.

Data Switch, One Enterprise Drive, Shelton, Conn. 06484. 203-926-1801.

Links

Retix Corp. has unveiled its **Retixgate Model 2244 Mac Bridge**, designed to connect IEEE 802.3 networks.

According to the vendor, the product can be used to interconnect two networks either directly or through a backbone network. Two individually configurable ports are available. It is said to process up to 6,000 packet/sec. while filtering up to 10,000 packet/sec.

The Retixgate Model 2244 Mac Bridge costs $1,950.

Retix, 2644 30th St., Santa Monica, Calif. 90405. 213-399-2200.

Modems/Multiplexers

A single modem designed to support up to three applications or protocols simultaneously in one telephone circuit has been announced by **Paradyne Corp.**

The modem, called the **3455 MVM**, supports 14,4K bit/sec. throughput as well as three channels in both directions. Both synchronous and asynchronous protocols are supported.

Other features include a trellis-coded modulation technique, the vendor's Analysis network management diagnostics, dual-call, autoanswer and dial restoral.

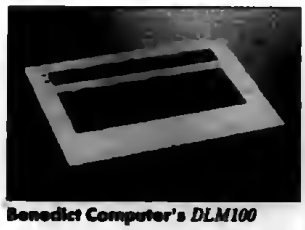
The 3455 MVM cpsts $6,100.

Paradyne, P.O. Box 1347, 8550 Ulmerton Road, Largo, Fla. 33540. 813-530-2000.

Diagnostic equipment

A hand-held line monitor for testing RS-232 communication lines has been announced by **Benedict Computer.**

The **DLM100** features nine bit/sec. rates ranging up to 38.4K bit/sec. It offers full-duplex operation, a 28K-byte buffer, printer output, a capture buffer and menu retention with power off. The device displays 80 characters with six push buttons, and there are four scroll-and-page rates, which operate forward and backward.



Benedict Computer's *DLM100*

The DLM100 is priced at $795.

Benedict Computer, P.O. Box 1259, Menlo Park, Calif. 94026. 415-323-0148.

NEW AT COMDEX/FALL '87

Proteon, Inc. introduced its **P2440** series repeater wire centers featuring integrated reclocking repeaters.

The wire centers physically connect four, eight or 12 nodes to Proteon's 1M bit/sec. Pronet-10 token-ring network. Prices range from $685 to $1,275. Proteon, Two Technology Drive, Westboro, Mass. 01581. 617-898-2800.

Artisoft, Inc. unveiled **Lantastic**, a local-area network (LAN), and **Lanmark**, software for the IBM Personal Computer and compatibles.

The IBM Netbios-compatible LAN can connect up to 32 micros within 500 to 1,500 ft without a repeater. It costs $199 per network station. Artisoft, Suite 330, 3550 N. 1st Ave., Tucson, Ariz. 85719. 602-293-6363.

Atari Corp. announced **Moses Promislan**, a Netbios-compatible LAN said to connect up to 17 personal computers in a star configuration using off-the-shelf telephone wire.

Priced at $599, the LAN also provides an interface to Apple Computer, Inc.'s Appletalk. Atari, 1196 Borregas Ave., Sunnyvale, Calif. 94086. 408-745-2000.

Easynet Systems, Inc. announced the **Easynet 116**, a LAN system said to permit personal computer peer-to-peer network communications at speeds up to 1.5M bit/sec. per twisted-pair cable. It costs $595 per station.

Easynet also announced **Easynet II**, a zero-slot LAN that allows two micros to share resources. It costs $169. Easynet Systems, 4283 Village Centre Court, Mississauga, Ont., Canada L4Z 1S2. 416-273-6410.

A personal computer-to-facsimile communications package for the IBM Personal System/2 has been announced by **Gammalink.**

Called **Gammafax MC**, it provides PC-to-remote facsimile transmission and PC-to-PC file-transfer capabilities. It costs $995. Gammalink, 2452 Embarcadero Way, Palo Alto, Calif. 94303. 415-856-7421.

Modems were announced by such vendors as **Codex Corp.**, offering a 19.2K bit/sec. data modem; **Microcom, Inc.**, with a 19.2K bit/sec. MNP modem; and **U.S. Robotics, Inc.**, with six new or enhanced modems, including an internal model featuring data compression for the IBM PS/2 Micro Channel-based computers.

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Dr. John McQuillan, President, McQuillan Consulting

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Attend this tutorial for a comprehensive overview of today's LAN environments. Discussion will include how to tie diverse and often incompatible network elements together in a manageable, logical way, as well as alternatives to LANs. **Level:** Advanced.

T-3 ISDN: STANDARDS, PRODUCTS AND SERVICES
James G. Herman, Independent Consultant, and **Mary Johnston,** Senior Consultant, Telecommunications Consulting Group at BBN

ISDN is fast approaching. Some say with too little agreement on fundamental standards and applications. Attend this highly focused, intensive session to anticipate the emerging standards, vendor trials, conflicts, successes, products and service offerings that will emerge over the next several years. **Level:** Intermediate.

T-4 MULTIVENDOR NETWORK MANAGEMENT
Jerry McDowell, Vice President, Vanguard Telecommunications Inc.

Enroll in this intensive tutorial for skills in how to manage a network which links multiple carriers and a variety of hardware and software vendors in one corporate network. You will learn how to take control into your own hands and avoid finger pointing, acrimony and poor service. **Level:** Intermediate.

T-5 HOW TO BECOME A BETTER TELECOMMUNICATIONS MANAGER
Gerald P. Ryan, President, Connections Telecommunications Inc.

Today's network manager must not only understand new technologies and standards, but must also play many roles in the company. Attend this instructive tutorial for an entertaining and thought-provoking look at what you need to know to be a successful network manager, plus the tools, processes, and organization that will maximize your efficiency. **Level:** Intermediate.

T-6 THE LATEST LOOK AT NETWORK STANDARDS AND OSI
Richard desJardins, Director of Technology R&D, Computer Technology Associates Inc.

As OSI and the older standards are reaching maturity, numerous new standards are in the works. Attend this intensive session for a look at the new generation of standards — including their purpose, significance, applications, and technical elements. **Level:** Introductory.

T-7 MODELING AND DESIGNING DATA AND INTEGRATED NETWORKS
Dr. Wushow Chou, Professor of Computer Science and Electrical and Computer Engineering, North Carolina State University

Enroll in this tutorial for detailed instructions on how to design integrated networks. You'll learn about combining voice and data on a single architecture to maximize the efficiencies of wideband services, the migration from classical multipoint to distributed systems, plus cost-efficiency issues and other practical considerations. **Level:** Advanced.

T-8 IBM NETVIEW: INDUSTRY WIDE IMPLICATIONS
Atul Kapoor, Vice President, Kaptronix Inc.

This tutorial gives you a thorough and comprehensive introduction to IBM's NetView and NetView/PC — their operation, technical specs, dependencies and functional interactions, plus an analysis of their impact on the industry, significance for users, and practical suggestions for implementation. **Level:** Intermediate.

T-9 OPEN NETWORK ARCHITECTURE: CARRIER/VENDOR/USER IMPLICATIONS
Haines Gaffner, President, LINK Resources Corp.

The FCC has ordered AT&T and the RBOCs to adopt ONA to stimulate competition in enhanced data processing services over public switched networks. Enroll in this tutorial to learn the details of the ruling, its implications for service offerings and an overview of who the players will be. **Level:** Intermediate.

T-10 INTERNATIONAL NETWORKS: SOLVING THE PRACTICAL PROBLEMS
Len Elfenbein, President, Lynx Technologies Inc.

Attend this tutorial if your company is expanding its network outside the U.S. You'll receive immediately useful information on tariffs, rules, how to handle ordering and service delays, the role of the PTTs, how to deal with the lack of consistency from country to country, and many more issues you must confront to succeed. **Level:** Intermediate.

cess network!

year for telecommunications professionals

T-11 BUILDING THE NETWORK CONTROL CENTER
Gabe Kasperek, President, Kazcom Inc.

This one-day course will help you successfully operate a network control center on a day-to-day level. You will focus on the practical requirements, functions to be performed, systems and tools available and how to put them all together to gain control over your network. **Level:** Introductory.

T-12 REGULATORY ISSUES AND ANSWERS
Richard E. Wiley, Senior Partner, Wiley, Rein & Fielding

Take this comprehensive seminar to make sense of the increasingly complex regulatory environment. You will receive a thorough briefing on the legal, social, and regulatory issues, the evolution of vendor technology and industry standards, and significant developments affecting the coming regulatory year. **Level:** Intermediate.

T-13 INTRODUCTION TO DATA COMMUNICATIONS
Gary Audin, President, Delphi Inc.

This perennially popular tutorial provides exactly the right mix of concept, technology, and application for the beginner to get a good foundation in data communications. The course notes are excellent reference material and the instructor is one of the most highly regarded professionals in the industry. **Level:** Introductory.

T-14 INTRODUCTION TO VOICE COMMUNICATIONS AND PBX
James Morgan, Principal, J.H. Morgan Consultants

Enroll in this full-day tutorial for a comprehensive foundation in the basics of voice communications — technology, PBX characteristics, switched networks, tariffs and services, as well as an overview of traffic engineering. **Level:** Introductory.

T-15 IMPACT OF THE NEW POST-DIVESTITURE TARIFFS ON LARGE NETWORKS
Robert L. Ellis, President, The Anes Group

In this intensive tutorial you will learn the structure of the post-divestiture tariffs, the latest January 1988 changes to these tariffs, how to price interstate private lines, how to configure and price interstate FX services, the new economics in configuring data networks, the LATA-pure strategy and federal access tariffs and how to use them. **Level:** Intermediate.

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CCWK16

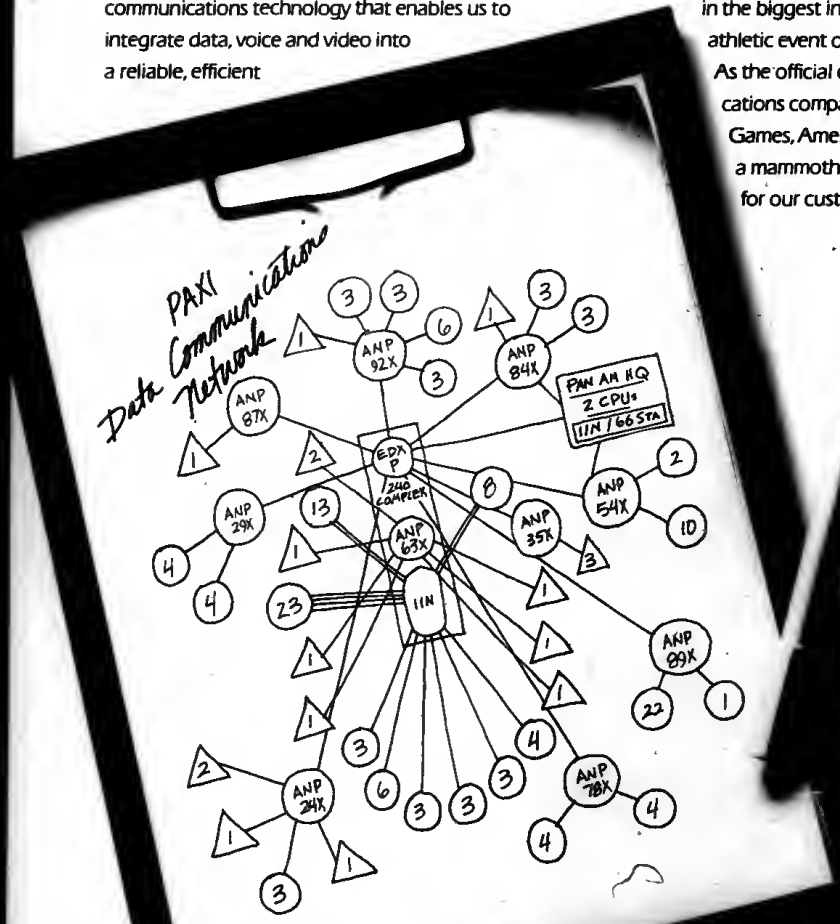
38 NATIONS
4,400 ATHLETES
41 LOCATIONS
LINKED TOGETHER BY
1 COMMUNICATIONS
PROVIDER:

AMERITECH

YOU CAN BENEFIT FROM THE WAY WE PLAYED THE GAMES.

The Tenth Pan American Games were both a challenge and an opportunity for Ameritech. They helped demonstrate the state-of-the-art communications technology that enables us to integrate data, voice and video into a reliable, efficient network for any business.

More than 4,400 athletes from 38 nations came to Indianapolis in August, 1987 to compete in the biggest international athletic event of the year. As the official communications company for the Games, Ameritech had a mammoth job to do for our customers.



LINKING THE GAMES THROUGH A CUSTOMIZED NETWORK.

We provided the communications system which brought the Games together. Ameritech engineered, installed, pretested, operated and managed this highly sophisticated network that included fiber optic transmission and digital switching technology.

SO MANY NEEDS. ALL OF THEM CRITICAL.

Communication was the very heart of the Games. Information concerning everything from security checks and accreditations to medical data, transportation scheduling and event results had to move quickly, dependably and accurately from point to point. If the information stopped flowing, the Games would come to a halt.

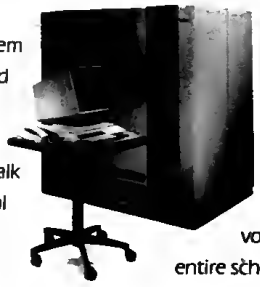
What's more, a great number of locations were involved. These included 23 separate Game sites in and around Indianapolis. There were also 18 operating divisions of PAX/Indianapolis, the Organizing Committee for the 10th Pan American Games. Our network had to link all these locations together.

In performing this complex assignment, we functioned as PAX/I's communications partner, much the same way we work with all our customers.

HELPING STRANGERS COMMUNICATE.

Ameritech was the systems network manager for the Pan Am Games organization. That meant assuring the integration of our network with equipment and software from a number of different manufacturers.

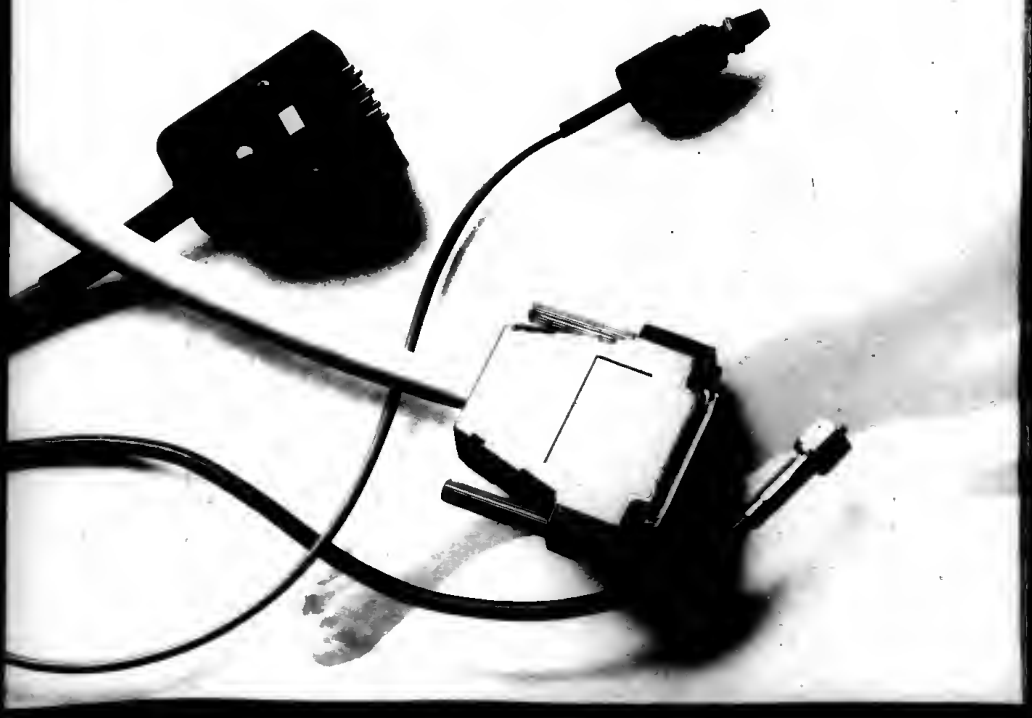
We had to design a system where diverse elements could operate in harmony. So that, for example, one supplier's mainframe computer could talk to another supplier's personal computers and both could talk to a third supplier's data terminals.



WE TOOK THE TIME TO PLAN, TO CHECK AND RECHECK.

We set the groundwork carefully, because we know that thorough planning is vital to efficient systems integration. The more effort we devoted at this stage, the surer we could be that the Games would run without any interruption in communications.

Our plans were designed to provide an integrated, end-to-end voice, data and video system for the entire schedule of the Games.



AMERITECH'S SPECIAL PAN AM NETWORK SIMULATOR.

We have a long history of managing the complex public communications network. We drew on this experience and used off-line simulation so every type of technology the customer was considering for the Pan Am Games could be tested in a network configuration. It was a comprehensive, realistic proving ground for hardware, software and the system itself, and it gave us the opportunity to gain experience in spotting and correcting potential problems.

This simulation procedure is the kind of in-operation pretesting that Ameritech can provide for business communications.

A TROUBLE-FREE SYSTEM OPERATING CONTINUOUSLY WITH SPLIT-SECOND SPEED.

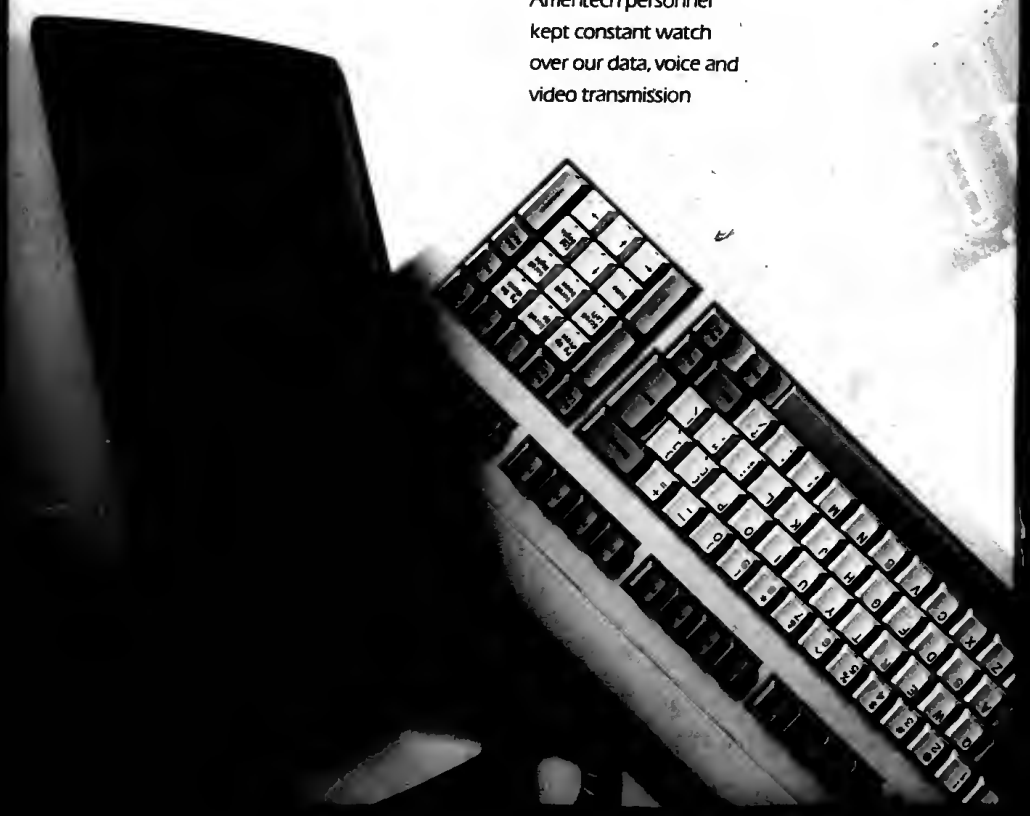
Systems network management is the key to successful communications. Our management experience and expertise enabled us to keep information flowing without interruptions during the Pan Am Games.

Ameritech had the capabilities to provide continuous end-to-end monitoring and diagnosis of every component of the Pan Am Network. So the network functioned smoothly and the full measure of its power was available at all times during the Games.

THE NETWORK MANAGEMENT CENTER.

Here was the brain behind the integrated network system that Ameritech designed and operated for the Games. The Network Management Center was equipped with the world's most sophisticated tools for tracking, detecting and isolating potential problems.

At the Center, Ameritech personnel kept constant watch over our data, voice and video transmission

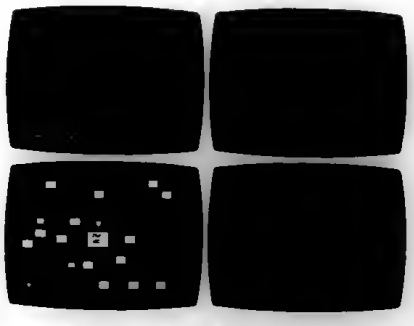


facilities. We also have the expertise to monitor and maintain other suppliers' equipment.

HOW TO CATCH A GLITCH.

We stopped trouble in its tracks by quickly pinpointing conditions that could produce a problem. It might have been in an individual circuit. Or it might have been in a terminal control unit. Whatever the cause, Ameritech people could spot it and take the steps to have it fixed. All done so speedily and efficiently that the problem never became a problem for the customer.

This same high level of service is available to businesses in the Ameritech region.



Monitoring screens in the Network Management Center quickly help trace, pinpoint and overcome potential problems. The Center has incredible trouble-shooting capabilities.

AMERITECH

THE TALENT, THE TECHNOLOGY, THE TEAM.

Ameritech put an all-out effort into assuring the success of the Pan Am Games. Our highly skilled people worked as a team to create and implement the solutions that helped the Games communicate.

We assembled experts from our Ameritech Bell companies of Illinois, Michigan, Ohio and Wisconsin to assist our primary communications team from Indiana Bell. Customer support was also provided by other members of our Ameritech family as well: Ameritech Mobile, Ameritech Publishing and Ameritech Communications. Then we gave these specialists all the tools they needed.

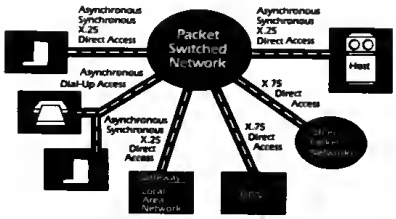
WE BRING ADVANCED TECHNOLOGY WITHIN REACH OF EVERY BUSINESS WE SERVE.

Through the products of the Ameritech Business Network, we can help all our customers handle a full range of data, voice and video communications. Our network can transport both high and normal volumes of information, in continuous or intermittent streams.

What is more, this advanced communications network is already in place. We're in position to provide the systems and support you need.

THE AMERITECH BUSINESS NETWORK WAS READY FOR ACTION.

The Ameritech Business Network, a family of advanced digital communications products, was available for the Games.



The Ameritech Packet Switched Network. One of the Ameritech Business Network products that helped the Pan Am Games communicate.

It enabled us to provide greater flexibility and cost efficiencies in the movement of information, and it played a key role in every stage of the Games' operation.

Some of the locations needed only reliable voice communications. Some also needed high-speed, highly accurate data transmission over private digital lines. Others required the speed and security of private line transmission along with the economies offered by our public communications network.

The products of the Ameritech Business Network met all these needs. They can be tailored for any specific situation, and they provide the exceptional control necessary to adapt to changing business requirements.

Ameritech's Pan Am communications network included more than 5,000 voice, data and video circuits, some 1,300 miles of fiber optic cables, 1,300 telephones, and 40 cellular mobile telephones. Ameritech also published special multilingual phone directories for the Games.

AMERITECH

PUT OUR TRACK RECORD ON YOUR SIDE.

Communications can be the winning difference for your business. Because, as you know, information is becoming a greater and greater source of business power. The race will be won by those who gather and use that power to their best advantage.

The companies of Ameritech can help you communicate faster, more efficiently and more economically. No matter how complex your needs are. No matter how varied.

WE'RE A LEADER IN APPLYING COMMUNICATIONS NETWORK TECHNOLOGY.

The Pan Am Games were an example of how Ameritech can integrate the essentials of business communication—voice, data and video—into an efficient, reliable network to transport and manage information.

We're committed to understanding the communications needs of your business as well as you do. Ameritech will work in partnership with you to develop customized applications of the Ameritech Business Network and our other world-class products and services.

We help establish vital communications links between businesses that need each other.

ASK US TO PROVE OUR WORTH TO YOU.

Your own communications needs are unique. You have critical locations to link. Growth to consider. Above all, you want to be sure of having the right system for fast, accurate and dependable operation.

Give Ameritech the challenge. We've shown we have the talent, the technology and the team to bring your business a winning performance.

AMERITECH

THESE ARE THE COMPANIES OF AMERITECH.

The resources of the Ameritech companies helped bring you the Pan Am Games by designing and managing the most modern communications system available today. These same resources are available to serve you and meet your total communications needs.

AMERITECH'S BELL COMPANIES and their sales subsidiaries provide advanced communications services to more than 11 million business and residential customers in the Great Lakes area. The Bell companies are: Illinois Bell, Indiana Bell, Michigan Bell, Ohio Bell and Wisconsin Bell.

ADR (Applied Data Research, Inc.) develops, markets and supports a comprehensive line of systems software products primarily for IBM mainframe and personal computers.

AMERITECH COMMUNICATIONS provides marketing support and state-of-the-art equipment and systems to the Ameritech Bell companies' sales subsidiaries. It has a national sales and service arm of its own.

AMERITECH CREDIT CORPORATION arranges competitive financing for companies that lease communications products and services through the Ameritech Bell companies and their sales agents.

AMERITECH DEVELOPMENT CORPORATION supports the growth of the Ameritech companies by finding and developing new products, technologies and business relationships that complement Ameritech's strategic direction.

AMERITECH MOBILE COMMUNICATIONS provides wirefree communications including advanced cellular mobile telephone and paging products and services.

AMERITECH PUBLISHING publishes Ameritech PagesPlus® directories for the Ameritech Bell companies and other specialty directories.

AMERITECH SERVICES, owned jointly by the Ameritech Bell companies, provides staff support to help the companies attain their business goals.

For more information on how the Ameritech companies can help you communicate, call us at 1 800 562-2444.

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SYSTEMS & PERIPHERALS

HARD TALK

James Connolly

The PCM pendulum

When you're hot, you're hot. When you're not, you're not — at least until you get hot again. Follow that logic, and it is easy to follow the mainframe business.

Just a year ago, IBM appeared to have its primary mainframe competitors, plug-compatible manufacturers (PCM) Amdahl and NAS, a bit on the run. IBM was building its market share on the strength of its 3090 shipments, and NAS and Amdahl seemed to be slipping.

Now, however, things have changed, according to an analysis by consultant Bob Djurdjevic, president of the Phoenix market research firm Annex Research.

To some observers, it may matter little whether IBM owns 100%, 90% or 50% of the large systems market. But the 10% or so market share that the PCMs aim in IBM-compatible environments serves a purpose. Just as it has for the little more than a decade since Amdahl and NAS predecessor Itel entered the PCM business, the plug-compatible makers' mere presence obviously helps to keep IBM prices in check and IBM de-

Continued on page 63

Memorex adds 9335 alternative

Claims 3835 disk drive weighs less, offers floor space savings

BY STANLEY GIBSON
CW STAFF

MILPITAS, Calif. — Having made a foray earlier this year into the IBM mid-range products arena, Memorex Corp. announced last week the 3835 disk drive, which is compatible with IBM's 9335 device.

In addition, Memorex announced a streaming tape subsystem and add-on memory for the IBM System/36 and two printers for the System/36 and 38.

The 855M-byte IBM 9335 disk drives, announced in June 1986, can be used with System/38 and IBM 9370 minicomputers. The Memorex 3835 subsystem, also containing 855M bytes, is the second plug-compatible 9335-type disk drive to be announced this year. In June, EMC Corp. in Hopkinton, Mass., announced its Guardian subsystem.

Favorable options

Memorex claimed its 8-in.-diameter 3835 has several advantages over the 14-in. 9335. It offers twice the capacity per square foot of floor space, weighs half as much and uses half the power of a 9335 system, according to Memorex. Rack-mounted 3835 disk drives are stacked vertically in an adjustable rack that can contain two strings of four drives each.

Greg Grodhaus, vice-president of Memorex's small-systems group, claimed the 3835 can perform at higher sustained data rates than the 9335 because of a 512K-byte cache. Grodhaus said another 3835 feature, Dynamic Data Relocation, reduces access time by relocating a user's most frequently used data to adjacent tracks on a disk. Look-ahead buffering increases the 3835's data transfer rate by anticipating the next data to be used and loading the data into the buffer, according to Grodhaus.

The subsystem consists of a Memorex 3838 controller, 3835 disk drive and 3839 storage rack. With four disk drives on a string, capacity is 3.4G bytes.

A 3838 controller is priced at $8,500, and a 3835 disk drive is priced at $21,250. A 3839-1 storage rack, for one string,

Continued on page 63

Optical unit manages 66 cartridges

COLORADO SPRINGS — Optotech, Inc. recently introduced a jukebox-style autochanger for 5¼-in. write-once read-many optical drives.

The company said Optofile manages up to 66 optical-disk cartridges and up to four drives to provide up to 26.4G bytes of on-line storage.

The system uses Optotech's 400M-byte disks and is targeted at medium-size businesses, according to the company.

The vendor claimed the system features a unit cost of 62 cents per megabyte.

Optofile includes a small computer systems interface (SCSI) and allows daisy-chain connection of two or more systems using RS-232 connections.

The vendor said it is particularly suited for use in document storage, image processing, on-line mass storage and backup of large data processing systems.

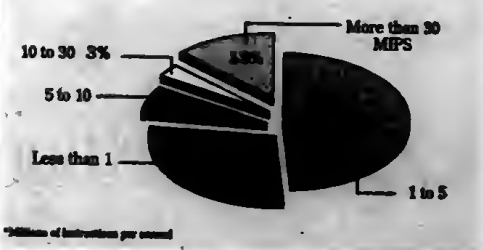
The SCSI and Optotech's

Continued on page 63

Data View

Mid-size shops opt for IBM mid-range box

*Most on-order 9370s bound for sites now using less than 5 MIPS**



*Millions of instructions per second

INFORMATION PROVIDED BY COMPUTER INTELLIGENCE
CW CHART

Tape drive enhanced

BY STANLEY GIBSON
CW STAFF

MILPITAS, Calif. — Memorex Corp. said last week it will offer a data-compression feature designed to give its 5480 tape cartridge subsystem a functional advantage over IBM's similar 3480 device.

According to a Memorex spokesman, the feature will compress data by 50%, compared

Continued on page 63

Inside

- Parallel Computers offers fault-tolerant Unix-based system. Page 63.
- American Digital introduces DEC-compatible disk systems. Page 63.
- U.S. Imaging and Securities announces a turnkey imaging system. Page 68.

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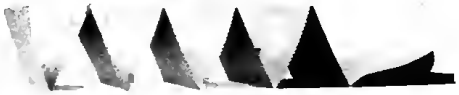
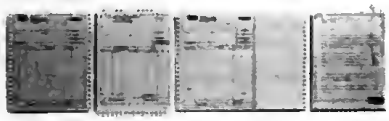
▶ Our ISI 462 band line printer produces high-quality draft output at up to 720 lines per minute. It's available in IBM 3270 and S/3X plug-compatible models, each with an optional "quietized" cabinet.

If we said our printer did 90 pages a minute, used fanfold paper,  printed  electronic forms, didn't take up much space, used a new non-impact technology, was extremely reliable, and didn't cost a fortune,

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For more information, call 1-800-541-BULL.

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Parallel aims Unix at small companies

BY STANLEY GIBSON
CW STAFF

ANAHEIM, Calif. — In an effort to bring fault-tolerant computing to small and medium-size companies, Parallel Computers, a wholly owned subsidiary of General Automation, Inc., recently announced the Parallel 400XR Series.

Parallel described the Unix-based 400XR as an entry-level computer system for up to 120 end users. The system is redundant in hardware but contains no fault-tolerant software features, according to Parallel spokesman James Allen.

Unix applications can run without alteration on the fault-tolerant system, the vendor claimed.

The system supports up to 120 serial terminals and printers and uses duplexed processors based on Motorola, Inc. 68020 16-MHz microprocessors. Each processor unit comes with 2M bytes of memory expandable to 4M bytes.

The system comes with dual 5¼-in. Winchester disk drives, Intel Corp. 80186-based disk controllers and dual uninterruptible power supplies. A copy of all data is maintained on each disk subsystem.

The 400XR also offers a self-diagnostic feature that provides continuous automatic monitoring of all system components.

If a component fails, a computer operator may order a replacement part and swap the components without professional help, Allen said. In addition, the system can shut down automatically in power outages, he said.

Parallel said it will sell the system to value-added resellers and OEMs with a suggested retail price ranging from $42,900 to $80,000. The system is scheduled to ship in January.

Disk drive compatible with DEC's

SUDBURY, Mass. — American Digital Systems recently introduced an 8-in. disk drive designed to provide up to 2.88G bytes of storage for users of Digital Equipment Corp. Q-Bus- and Unibus-based systems.

The Masterdisk Series 8, which is scheduled to be shown for the first time at the Dexpo West show next month, is built around Control Data Corp.'s Sabre 850 drives and American Digital Systems' controller. The vendor said the subsystems are available with up to 1M byte of cache memory and feature average disk access times as low as 6 msec and typical average access times below 10 msec.

The system is available in an internal rack-mount or floor-standing configuration and was designed to be fully hardware and software compatible with all DEC Q-Bus and Unibus processors.

Prices for the Series 8 product line range from $16,750 for a 721M-byte Q-Bus system to $57,550 for a 2.88G-byte Unibus system.

Tape drive

FROM PAGE 61

with the current Memorex 5480 and IBM 3480 subsystems.

The compression is accomplished by a hardware feature in the controller, which is priced at $12,500, according to the spokesman.

Memorex also said it will offer a 4.5M-byte/sec. channel speed for its 5480 subsystem at a price of $3,000.

Both the data-compression option and the faster channel speed will be available through field upgrades and in new equipment in the first quarter of 1988, according to the spokesman.

In addition, Memorex and Fujitsu Ltd. have signed an agreement to develop an automated 3480-type tape library system, to be introduced sometime in 1988, according to the spokesman.

Under the agreement, Fujitsu will manufacture the system, which will be able to handle from several hundred to as many as 5,000 tape cartridges, the spokesman said.

Memorex has not yet established a price for the system, and the firm would not say precisely when the device would be available.

Firm offers 3174-compatible system

Controller allows configuration flexibility with field upgrades

HACKENSACK, N.J. — Intelligent Information Systems, Inc. last month announced a controller designed to be compatible with the IBM 3174 communications controller while allowing configuration flexibility through field upgrades.

The IS-374R is compatible with all 3174 controllers and supports up to 32 terminals and printers, according to the vendor. It uses very large-scale integration technology and is built around two microprocessors.

It was designed to support communications speeds of up to 19.2K bit/sec. in bisynchronous and up to 64K bit/sec. under IBM Systems Network Architecture/Synchronous Data Link Control.

It features 500K bytes of memory and a built-in diskette drive for microcode downloading.

Connection options

Configuration options allow connection of up to eight ASCII printers using an RS-232 adapter, connection of up to eight IBM 3299-type multiplexers, integrated coaxial doublers and use of RJ11 jacks with built-in baluns.

Intelligent Information Systems said the IS-374R handles the full range of IBM 3270-type peripherals, including the IBM 3191 and 3192 display stations and their Intelligent Information Systems equivalents.

The controller is available 30 to 60 days after receipt of order. A low-end configuration costs $3,000, and a high-end, 32-line version costs about $9,000.

Memorex

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costs $2,500; a 3839-2 storage rack, which can support two strings, costs $3,000. Prices for the disk drives and controller match current list prices for IBM 9335 disk drives, according to a Memorex spokesman.

The 3835 disk drives are manufactured by Northern Telecom, Inc., and the 3838 controllers are manufactured by Acceleron in Sunnyvale, Calif. The subsystem will be available in the first quarter of 1988.

Despite Memorex's claims of superior performance for the 3835, one analyst cautioned that any advantage might be short-lived. David Andrews, president of ADM, Inc. in Cheshire, Conn., said IBM is likely to enhance the 9335 within the next six months, before the company's "System/3X follow-on product," also known as Silverlake, is announced.

Andrews said a higher density version of the 9335 is likely. In addition, he said, IBM will announce smaller capacity disk drives for the mid-range, most likely based on the drives used in the Personal System/2 and the System/36 Model 5363. He also said a disk drive of greater capacity than the increased-density version of the 9335 is likely.

Memorex also announced a streaming tape subsystem for System/36 users. The 5157-2 is compatible with IBM's 6157 streaming tape drive, according to Memorex.

The tape unit is capable of automatic batch and master file backup, performing at a minimum transfer rate of 2M byte/min., according to the vendor. The 5157-2 is available immediately. In single quantities, the 60M-byte model costs $2,970, the 120M-byte model costs $3,630, the 240M-byte model costs $5,500 and the 300M-byte model costs $6,600.

Memorex announced add-on memory for System/36 Model 5360 and 5362 processors, at prices it claimed are up to 20% lower than IBM list prices. The 9100 series of add-in memory cards comes in capacities of 256K bytes, priced at $1,000; 512K bytes, priced at $2,000; 1M byte, priced at $3,000; and 2M bytes, priced at $6,000.

Memorex also announced a dot matrix printer, the 2210, that is plug-compatible with the IBM 4210 and offers color printing. Slated to be available in the first quarter of 1988, the 2210 is priced at $1,895.

Memorex also announced the 2815 wide-carriage screen printer, which is addressable from several of Memorex's display stations and can attach to the company's 7000 series personal systems as well as to IBM Personal Computers. The 2815 carries a list price of $510 and is scheduled to be available in the first quarter of 1988.

Optotech

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software interface make Optofile a "plug and play" solution for use with Sun Microsystems, Inc.'s Sun-3 workstation, Digital Equipment Corp.'s Microvax II, IBM's Personal Computers and Personal System/2s and other Intel Corp. 80286- and 80386-based microcomputers, and Apple Computer, Inc.'s Macintosh systems, according to Optotech.

Optofile is scheduled to be available in evaluation quantities in December and in production quantities during the first quarter of 1988.

An entry-level system, including one drive and one cartridge, costs $9,950 in OEM quantities, according to the vendor.

Pendulum

FROM PAGE 61

velopers working to improve price/performance and functionality.

The two PCMs give users two more bargaining chips in their dealings with IBM, even if individual users never buy a PCM processor. The PCMs stand still taller in importance as the non-IBM-compatible mainframe makers, formerly known as the BUNCH, retrench and concentrate on holding their installed base.

Djurdjevic's analysis, conducted in cooperation with the La Jolla, Calif., market research firm Computer Intelligence, showed that NAS, with a 4.1% market share, and Amdahl, with a 6% market share, owned 10.1% of the IBM-compatible market in 1983, based on unit shipments in the U.S. Their share slipped to 6.7% (3.3% for NAS and 3.4% for Amdahl) in 1986, when IBM's 3090s were in the heart of their product cycle.

During the first six months of this year, the PCMs recovered, with Amdahl grabbing 7.1% of the market and NAS taking 3.8%, based on annualized shipments. According to Djurdjevic, the PCMs have done well with their answers to the 3090. Meanwhile, demand for 3090s has slowed, despite IBM's 3090 E model mid-life kickers, announced earlier this year.

Djurdjevic said the scenario calls for users who are considering mainframe acquisitions to wait and see what happens. He expects IBM to try to go beyond the 12% price/performance gains delivered with the E models and possibly be forced to improve price/performance by between 17% and 25% with the debut of some F models in early 1988.

However, all of this does not mean life will be rosy for the PCMs. They still must deal with IBM's strategy of hiding important instructions in microcode and continually shifting key tasks between its CPUs and controllers. They must also cope with what some analysts see as IBM's tightening hold on the peripherals portion of IBM-compatible business.

The bottom line is that while business is going well for the PCMs now, the cyclical nature of their business means the road could get bumpy at any time.

Connolly is Computerworld's senior editor, systems & peripherals.

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NEW PRODUCTS

Turnkey systems

A turnkey imaging system for producing photo identification badges has been announced by **U.S. Imaging and Security, Inc.**

The system, called the **Photo Access Security System** (PASS), combines an employee's picture, signature and data into one data base that develops onto one piece of instant film. PASS can also incorporate bar codes or magnetic strips into the badges for automatic door or gate entry.

The PASS software package is available alone for $3,000. A stand-alone turnkey system is priced from $35,000 to $40,000.

U.S. Imaging and Security, Suite 350, 1300 Dexter Ave. N., Seattle, Wash. 98109. 206-284-3390.

Processors

Phantom, a performance-enhancement package for systems running Digital Equipment Corp.'s VMS, RT-11 or TSX-Plus operating systems, has been announced by **Multiware, Inc.**

The hardware and software package is said to feature direct-memory access, data transfer via two serial ports as well as a 16-bit bidirectional parallel port and 64K bytes of on-board memory.

According to a company spokesman, Phantom uses its on-board intelligent programmable direct-memory access engine to transfer data, freeing the CPU for other operations.

Phantom is priced at $3,500.

Multiware, Suite 107, Building B, 2121 Second St., Davis, Calif. 95616. 916-756-3291.

Data storage

The **754** VME controller, which is said to support up to four industry-standard high-speed storage module device-interfaced disk drives, has been announced by **Xylogics, Inc.**

The single-board 754 controller is said to support data transfer rates from 1M to 3M byte/sec. Different disk types, speeds and sizes can be intermixed, the vendor said.

Features include a 128K-byte first-in first-out buffer architecture; an enhanced, 48-bit error-correction control; and a read-ahead feature.

The Xylogics 754 costs $2,895.

Xylogics, 53 Third Ave., Burlington, Mass. 01803. 617-272-8140.

The **Laserdrive 510**, a 5¼-in., 654M-byte, write-once read-many optical disk drive, has been announced by **Laser Magnetic Storage International Co.**

The Laserdrive 510 offers 327M bytes of storage per side of a double-sided removable disk, a 600K-byte sustained transfer rate and a maximum track-to-track seek time of 1.5 msec. It features an embedded small computer systems interface (SCSI) supporting single-ended drivers to permit the daisy chaining of up to eight SCSI devices.

The Laserdrive 510 costs $2,880, and media costs $95.

Laser Magnetic Storage, 4425 Arrowswest Drive, Colorado Springs, Colo. 80907. 303-593-7900.

NEW AT COMDEX/FALL '87

The **Astra 400** series of 32-bit mulituser systems was announced by **NEC Information Systems, Inc.**

The series includes three models based on NEC's proprietary ITOS Rev. 19 operating system. Features include a 20-MHz clock speed, dual read/write channels and support for up to 32 communications lines. Other features include 1M byte of main memory expandable to 6M bytes and up to 468M bytes of hard disk drives. Prices range from $13,945 to $24,525. NEC, 1414 Massachusetts Ave., Boxboro, Mass. 01719. 617-264-8000.

A 19-in. color monitor designed for computer-aided design and manufacturing applications was introduced by **Sony Corporation of America**.

The **GDM-1953** features a vertically flat screen, a full-square cornered image display area and distortion-free graphics. It costs $4,195. Sony, 9 W. 57th St., New York, N.Y. 10019. 212-418-9427.

Flexstar Corp. announced the **FS2304 Disk Drive Test System**, said to be capable of testing four disk drives simultaneously.

It performs burn-in and parametric tests for small drive interfaces to ST506/412 standards. It costs $13,000. Flexstar, 606 Valley Way, Milpitas, Calif. 95035. 408-946-1445.

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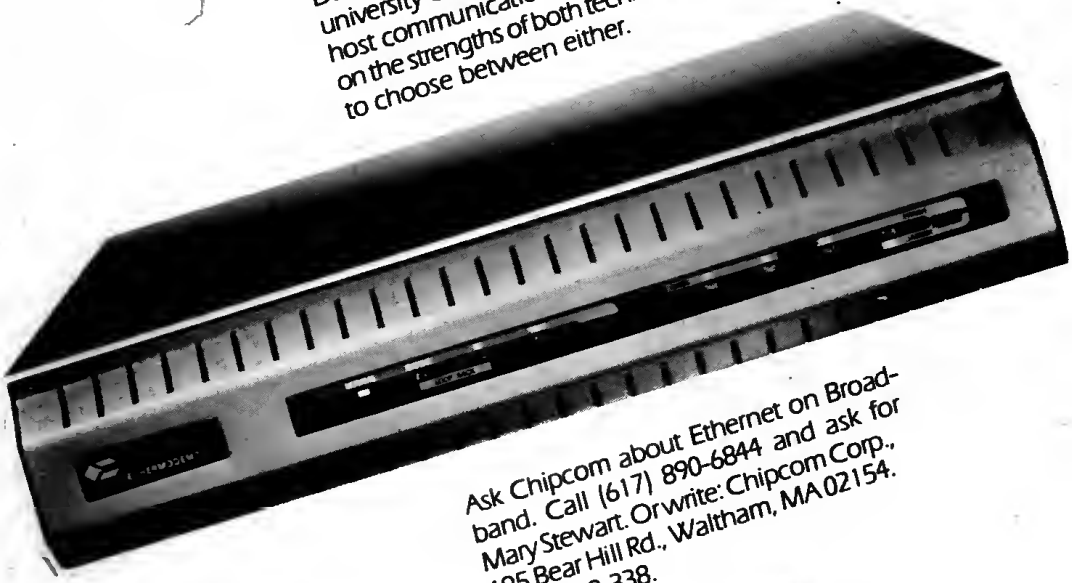

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INSIDE

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No maps lead to full interconnection; until standards emerge, firms must organize their own gear and try to stay on course

TREK TOWARD CONNECTION

BY LARRY DEBOEVER

LES RANTURER

Organizations are under great pressure to achieve full interconnection of data processing resources. Several forces combine to create this pressure, the greatest of which is, of course, the explosive growth in desktop computing. End users have already tasted the integration of previously scattered and disparate information. Now, more powerful machines, ranging from multitasking supermicros to mini-mainframes, are appearing at the departmental level to further whet their appetite for data and applications residing on corporate mainframes. Added to all of this is the fact that senior managers are becoming more anxious to harness the potential value of information as a strategic resource.

But that resource can be leveraged only if it is made easily available to potential users, and easy availability presupposes widespread user connectivity, a condition that does not yet exist.

Connectivity means a great many things to a great many people. Personal computer hobbyists who use Kermit to exchange files talk about connectivity. Private branch exchange vendors talk about connectivity. Data communications vendors talk about connectivity. And so do vendors of data base management systems and fourth-generation languages. But fundamental differences exist among each of these types of connectivity.

Corporate connectivity is connectivity of the most demanding sort. It requires logical interconnection of a corporation's dispersed information processing assets — hardware, systems software, user applications and data bases — a big step beyond mere physical connectivity. To the end user, corporate connectivity means the ability to access data, messages, information and other users throughout the corporation, without regard to the technical complexity of the required communications and systems integration tasks.

The ideal corporate connectivity environment is a fully interconnected network that permits users to navigate easily, to access dissimilar resources — including IBM hosts, departmental processors, network file servers or outside services — and to extract distributed data.

When a user interfaces with the network, all of the resources on it should appear to be part of a single, integrated entity. Users should also have ready access to a wide variety of services that make effective use of the network easy — particularly in information transfer and data transformation. The data transfer must be error-free, and the network must be responsive.

In a large corporate network, the user interface issue is much more difficult than it may immediately seem, involving what the user sees at his workstation, how thousands of nodes can be located and addressed and how many different screens are required to steer him through the maze of interconnections.

A PC user who is connected to a small, standalone local-area network (LAN) of 10 or 20 nodes can exercise only a limited number of options. He can access a file or print server or perhaps send a message to another user on the network. Possibilities multiply, however, when the small

DeBoever, president of DeBoever & Associates, Inc., a connectivity and systems integration consulting firm, recently wrote a major report on corporate connectivity. He serves as chairman of the International Connectivity Symposium.

Connection

FROM PREVIOUS PAGE

work-group network is tied into a larger corporate network — one of 500 or 1,000 nodes. Then the user can choose from dozens of options, including logon to the corporate hosts or departmental minis and access to electronic mail and data base applications.

As it stands now, each option may have its own syntax, its own logic and its own completely distinct world view. Willingly or not, the user has been transported from the communications equivalent of driving a tractor on a farm in Iowa to that of navigating a car through rush hour traffic in Rome.

Corporate maze

Corporations, departments within corporations and end users are already beginning to interconnect their information processing resources, but, unfortunately, this is often done in a disorganized and piecemeal fashion.

One major New York bank, for example, discovered that users had installed 20 different micro-to-mainframe links on the same CPU — all without MIS approval. A Midwest Fortune 1,000 manufacturer purchased a large LAN, only to find during installation that several work groups had already installed (but neglected to report) their own small office LANs. A major PC software vendor discovered that its internal development group was using three different and incompatible LANs on the same Ethernet cable.

Numerous obstacles stand in the way of full interconnection, and not all of them are technical.

When companies decide to make a significant connectivity effort, the decisions are often made by a committee with a very broad membership. The LAN selection committee at one major aerospace vendor, for example, consisted of 10 formal members, at least twice that number when "informal" members were counted.

The decision-making process is frequently disrupted by product or technology announcements. For example, many companies halted LAN procurements when IBM's Token-Ring network was announced.

Economic considerations also impact the decision-making process. Typically, strategic connectivity solutions, such as a large LAN, require budget cycles of at least 12 months. Life cycle costing is also an increasingly common requirement.

Finally, in most organizations, enormous pressure is exerted to preserve the substantial investment in existing DP and data communications equipment, staff, facilities, knowledge and procedures.

To effectively interconnect existing services with new services, standards must be promulgated and supported by vendors. Unfortunately, these standards have emerged slowly. Organizations that have implemented connectivity solutions are sometimes disappointed with the inadequate performance of the connection and/or the limited functionality.

Emerging standards key

The supporting structure for ideal corporate connectivity will be standards. Until solid standards emerge and products are delivered that implement them, full logical interconnection of corporate resources is not possible.

Many standards, such as Open Systems Interconnect (OSI) and Integrated Services Digital Network (ISDN), are being developed by international standards-making bodies. Others, such as IBM's Systems Network Architecture (SNA), are winning de facto status as a result of their visibility in the market.

> THE supporting structure for ideal connectivity will be standards. Until solid standards emerge, full logical interconnection is not possible.

Despite the large number of official and de facto standards and the broad support for them in most areas of data communications, technology matures into products much more rapidly than do standards for the same technology. In some instances, vendors simply refuse to work together to develop a standard for interchange. In other areas, they completely ignore the standard.

It is also true that many "standards" are so loose that implementors can meet the standards' requirements and still emerge with a product that is oot fully interoperable.

Peer-to-peer protocols

Despite these problems, companies are successfully creating solutions for their users, integrating both standard and nonstandard products. The simplest example is the use of IBM 3270 coaxial boards in PCs to allow them to emulate 3270 terminal functions. But it is increasingly likely that PC users can connect to a CCITT X.25-based value-added network using the IBM host as the gateway.

Of most importance to logical connectivity are protocols supporting cooperative processing.

Such protocols permit two

Continued on page S6

Broadband isn't just a pipe dream

BY STEPHEN TIMMS

The introduction of broadband communications does not, at this point, require implausible technological or imaginative leaps. A clear, market-led path to this technology can be identified, and the first steps along it have already been taken. An infrastructure for optical fiber communications is already taking shape, and there are business customers in the U.S. and Europe enjoying end-to-end fiber.

The phrase "broadband access," as used here, refers to the connection of a subscriber to wide-area public networks through a single physical link, which provides a data rate of more than 2M bit/sec. Subscriber access, particularly for business users, will increasingly be provided by optical fiber. Recent research into broadband has led Ovum, Inc. to coin the term "integrated broadband access," or IBA, to signify broadband access across a single optical fiber to a range of telecommunications networks, including narrowband.

Broadband applications require a higher data rate than is available in a typical narrowband Integrated Services Digital Network — higher, that is, than 128K bit/sec. Leading applications will include most implementations of video communications, but high-speed data communications will likely be the key commercial application.

Power shortage

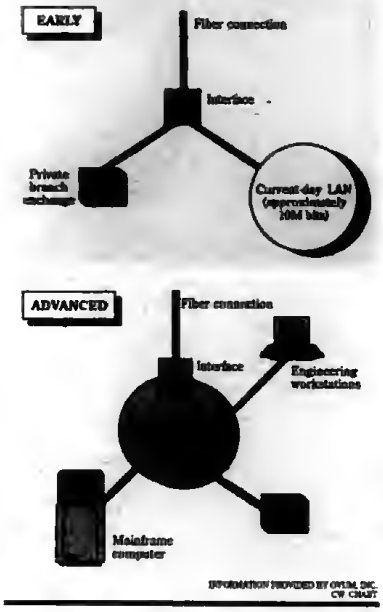
There is a growing mismatch between computing power and communications functionality available to business users. This will probably lead to a substantial demand for switched digital links at 2M bit/sec. and above before 1995, a demand that will increase rapidly throughout and beyond the late 1990s.

The kind of gap developing is illustrated by one of the collaborative artificial intelligence projects the British government is sponsoring under its Alvey Programme on new-generation computer technologies.

In the course of this project, individual AI terminals were distributed among several widely separated participant sites to send software between the workstations and a central mainframe in Manchester, England, via a dial-up communications link. The volume of software generated, combined with the low ceiling of available transmission speed, made transfers so slow they were barely practical.

Evolution of the LAN role in broadband access

Current architecture requires separate connections; eventually, all connections will go through high-speed local-area networks



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Such problems are bound to increase, and the introduction of 64K bit/sec. switched services will bring only temporary relief. Even at that speed, it takes an hour to send the contents of a magnetic tape and almost a day for the information on a typical compact-disk/read-only memory device. To bring communications speed back in step with desktop computing power will require switched communications links with speeds of approximately 50M bit/sec. by 1995.

The scale of demand for high-speed data is not easy to quantify. But engineering and AI workstations are being sold worldwide at a rate of about 50,000 per year, and many of these will need communications links. Ovum believes there will be more than half a million high-speed data terminals by 1995 in the four countries studied in depth — the U.S., the UK, France and West Germany.

LAN interconnection

A particularly important facet of the need for high-speed data communications via broadband is local-area network (LAN) interconnection. In present-day implementations, LANs and other customer-premise equipment generally have separate connections to the fiber interface. It is expected that all connections will go across a shared, high-speed LAN.

The interconnection of LANs as a special case of high-speed data is of considerable interest for the following reasons:

- LAN populations are increasing rapidly.
- Point-to-point inter-LAN links are already appearing.
- LAN transmission speeds are likely to increase dramatically in the next five years.
- Eventually, most high-speed data will pass over a LAN at the customer's premises.

The key question is not if but when the installed base of LANs will have evolved sufficiently to generate a substantial demand for switched broadband interconnection.

In 1985, about 8,000 LANs in Western Europe had speeds of 2M bit/sec. or higher — more than half of them in the UK, France or West Germany. In the U.S., the number was nearly 30,000 by 1985. By 1995, the number of LANs with data rates of more than 2M bit/sec. in the U.S. and Europe is likely to be 300,000.

Conservatively estimating that 10% of users will want access to a switched wide-area broadband network and that there will be five to 10 high-speed terminals per LAN, it is reasonable to say that LAN interconnection could account for up to 50% of the high-speed data terminals installed by 1995.

Initially, demand will probably be concentrated in small islands, such as financial and commercial centers already equipped with fiber-optic local telephone networks. But our research leads us to expect that in the next few years, broadband will play an increasingly important role for more sophisticated users. •

Timms is a principal consultant with Ovum, Inc., a consulting firm with offices in Princeton, N.J., and London. He is the principal author of the firm's recently published report, "Broadband Communications: The Commercial Impact."

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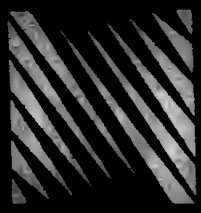

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Connection

FROM PAGE S2

applications — possibly on separate and dissimilar processors — to communicate in a peer (vs. a master-slave) relationship.

These protocols define the format, structure and rules to send and receive data among nodes and to manage and control network operations. Peer protocols are necessary to cooperative processing and implementing truly distributed applications. They are also necessary for effective use of fully interconnected corporate networks.

And then there were four

Several vendors offer proprietary peer-to-peer solutions for users of their products. However, few peer-to-peer protocols have been developed and supported by multiple vendors. Thus, it is difficult to achieve cooperative processing in a mixed-vendor environment.

ONE OF the major advantages of SNA, first announced in 1974, is that it is available and supported by IBM and virtually every major vendor.

The four "peer-to-peer standards" that have emerged are Transmission Control Protocol/Internet Protocol (TCP/IP), Xerox Network Systems (XNS) from Xerox Corp., SNA and OSI. These four protocols provide different services and have different architectures.

Of these four, only OSI, the newest, was developed by an international standards-making body. In fact, SNA is not a peer-to-peer protocol at all. IBM is developing an open architecture based on SNA and has included within SNA a peer-to-peer protocol called Advanced Program-to-Program Communications (APPC), also referred to as LU6.2.

There are 11 major "standards" likely to affect computer connectivity substantially during the next decade. These include all of the peer-to-peer protocols mentioned above except for XNS, which is losing momentum to TCP/IP and OSI.

SNA. One of the major advantages of SNA, first announced in 1974, is that it is available and supported by IBM and virtually every major computer vendor.

SNA employs a layered architecture roughly analogous to OSI with its highest layer (equivalent to OSI's Layer 7, Application) being provided by several IBM applications, including the following:

- Systems Network Architecture Distributed Services (SNADS), which provides store and forward facilities.
- Distributed Office Support System (Disoss), which provides centralized document storage and distribution services.
- Document Interchange Architecture/Document Content Architecture, which supports document transfer across the network and defines the format for those documents.

SNADS appears to be evolving into a full delivery and control layer of SNA. To achieve this, IBM is uncoupling SNADS from Disoss.

IBM is also aggressively developing several other services associated with its communications products, including the following:

- Distributed Data Management, which supports remote file access.
- Server Requester Protocol Interface, which supports remote procedure calls.
- Advanced Peer-to-Peer Networking (APPN), which permits users to establish sessions with remote applications without knowing the name of the application.

APPN also appears to be a significant strategic direction for IBM. It permits users to establish sessions with remote applications without knowing the location — for example, the node address — of the desired application. Path tables are not required. If the user does not know the desired application's

WE BELIEVE THAT THE GENIUS OF THE FUTURE LIES NOT IN TECHNOLOGY

address, the user's node broadcasts the application's name. Upon receiving the broadcast request, the node owning the application responds by sending its address to the sending node, and a session is established.

OSI. OSI was initially developed in Europe and was championed by the European Computer Manufacturers Association (ECMA). The ECMA said the best way to compete with IBM was to achieve full interconnection among member companies' products. The association enlisted the support of the International Standards Organization (ISO). From this collaborative effort, the ISO Reference Model of Open Systems Interconnect (ISO/OSI) emerged.

Today, OSI is still not completely defined at the highest layers, and complete implementations are not yet commercially avaiable. The OSI Reference Model is a highly structured, modular, seven-layer architecture. Each layer offers multiple options, or services, from which the user can select.

The lower layers (Layers 1 through 3) are concerned with the physical interconnection of processors. Standards for these layers are either IEEE 802 or CCITT X.25, depending on the type of physical network.

The higher layers (Layers 4 through 7) are concerned with the logical interconnection of the applications on those processors. Standards for Layers 1 through 6 have been well defined by ISO. Very little of Layer 7 has been specified by ISO.

Groups such as the Manufacturing Automation Protocol (MAP) task force and the Technical and Office Protocol (TOP) group formed to specify a set of OSI options and services to meet specific application problems.

TCP/IP. TCP/IP was developed in the late 1960s under the sponsorship of the U.S. Department of Defense Advanced Research Projects Agency (DARPA). It was the first peer-to-peer protocol for multivendor environments. Today, TCP/IP support is available for most processors. It finds strong support in DOD-related and manufacturing applications. However, it is considered by many to be outdated and incomplete.

LAN standards

LAN standards are largely the domain of the IEEE 802 committee. As mentioned earlier, the 802 standard has been embraced by ISO as the primary standard for Layers 1 through 3 — Physical, Data Link and Network. The 802 standards are relatively immature, best viewed as a stake in the ground rather than as permanent and complete specifications. There is so much elasticity in some of the current specifications that full interoperability among different vendors' equipment is unlikely without further refinement.

THE 802 standards are relatively immature, best viewed as a stake in the ground rather than as permanent and complete specifications.

The 802 standards are of two types — standards that apply to all 802 implementations (802.1 and 802.2) and standards that are unique (802.3 and above).

The 802.1 and 802.2 standards are high-level layers under which a specific media protocol is implemented. The 802.3, 802.4 and 802.5 standards are concerned with carrier-sense multiple access with collision detection (CSMA/CD) token bus and token-ring, respectively. These are protocols for accessing the media and standards for the media supported by that protocol.

It is important to note that each of the media protocol standards specifies both the media access protocol (Layer 2) and the physical media (Layer 1) for which that media access protocol is approved. Therefore, the media access protocol is independent of the media.

X.25. The international standard for packet switching, known as X.25, was originally adopted in 1976 by the Consultative Committee for International Telephone and Telegraph

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(CCITT). X.25 is the dominant form of wide-area networking in the world today, despite its low visibility in North America.

In Europe, X.25 networks are used to connect IBM 3270 terminal networks and, in fact, in support SNA. IBM Europe has noticeably improved its support for X.25 in the last few years.

X.25 does have some major users in North America, particularly in Canada. It will continue its steady growth in the U.S. as companies look for economically attractive wide-area networking solutions for previously unconnected users.

Netbios. The Network Basic Input/Output System, or Netbios, was developed by IBM as an interface between the LAN adapter card and the IBM Personal Computer operating system. Netbios was developed to support IBM's PC Network.

Netbios has become a de facto industry standard, with IBM's encouragement, and is now supported by most LAN vendors. At the same time, a new generation of PC applications, such as LAN-based data base systems, has been able to emerge.

Netbios is analogous to an interface to the Session layer (Layer 5) of the OSI model. This is clearly a higher level interface than is currently available for LANs through the 802 standards, which are concerned with Layers 1 and 2. Netbios creates and maintains virtual circuits between the user's PC and the desired node.

Although Netbios should be described as a standard because of the broad industry support, there are subtle differences between the various versions available. These incompatibilities should be resolved over time.

Expansion outlook for TCP/IP*

**Plans for increased use, based on preliminary survey results*

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High-speed net standards

ISDN is a multinational effort that will convert existing telephone networks from analog to digital. The result will be high-speed networking (64K bit/sec.) at very low cost. In fact, some projections suggest that ISDN will be cheaper than current leased-line charges.

High-speed digital communications will also give ISDNs the ability to simultaneously support voice, data, image and video.

The standards effort for ISDN has been led by the CCITT and PTTs, the government bodies generally responsible for postal, telephone and telegraph services. ISDN is mapped against and intended to support the OSI mode and has the support of AT&T and all the major PTTs. IBM is participating in ISDN field trials in Europe.

Fiber technology

Fiber promises to be a major media for corporate connectivity supporting high-speed communications. Its commercial application has been slowed by a variety of factors, including the following:

- High cost, although costs are declining quickly.
- Lack of standards for the media — diameter, light source and so on.
- Lack of standards for the signaling.
- Inability to reliably connect different types of fiber.

Given this uncertainty and high cost, most potential buyers have deferred acquisition. But a number of market research firms put forth an excellent argument that the differences among fiber media are usually minor and that a user can retrofit as required.

One of the most important fiber-related standards in development, from the perspective of computer connectivity, is the Fiber Distributed Data Interface (FDDI) being constructed by the ANSI X3T9.5 subcommittee. The standard is for 100M-bit optical fiber. It will primarily be used as a backbone in LANs requiring high capacity and as a bridge between networks.

Electronic mail

Electronic mail standards revolve around CCITT X.400, a messaging and document distribution protocol. The implementation of X.400 will permit different E-mail applications to interface, even if the applications are located on separate and dissimilar host processors. Applications other than E-mail that adhere to the X.400 standard will also be able to interface with E-mail applications, such as word processing packages.

X.400 is a well-defined standard with most byte positions tightly defined, although some bytes have been left open for file definition. Although few product implementations are yet available, virtually every E-mail or office systems vendor, including IBM, has announced its intention to support X.400. Such a broad base of support for the standard makes it a basic building block for connectivity.

In the long term, it appears that broad X.400 support will allow E-mail systems on private corporate as well as public networks to be fully interconnected. The outcome might well be a single, global mail network.

Document interchange

Document interchange is concerned with document transfer between different text editing or word processing systems. No industry standard for document formatting exists, despite users' persistent demands for one.

Most corporate users possess multiple document creation systems. They use several PC-based word processing software packages, stand-alone word processors from different manufacturers, different office systems on departmental minicomputers and host-based office systems.

The current de facto standard is IBM's Disoss. Vendors support interfaces to that standard primarily because no other standard is available. IBM has helped vendors that want to interface to Disoss by making some source code available to them. Other vendors offer Disoss tool kits to OEMs.

Disoss's shortcomings and limitations are widely recognized in the industry, but few alternatives exist if we want to achieve a "standard" for document interchange.

IBM is extending Disoss but seems most concerned with supporting compound documents. Such documents, which we will see within the next five years, will contain elements such as spreadsheets, files, data bases or images in addition to text. Eventually, the range of possibilities could even extend to voice notations and video.

Electronic data interchange (EDI) is a standard for the transmission of financially related business information between companies in machine-readable form. It is also referred to as EBDI for electronic business data interchange.

> **IT APPEARS that X.400 support will allow E-mail systems to be fully interconnected. The outcome might well be a single, global mail network.**

The effort to develop the EDI standard goes back to 1978 and is the responsibility of the ANSI X12 Committee. EDI could substantially improve, and perhaps even revolutionize, intercorporate efficiency by automating financial information exchange.

Today's paperwork would be replaced by electronic data communications of relatively fixed format messages describing specific transactions. The types of business transactions for which EDI is intended are order placement and processing, shipping and receiving information, invoicing and payment.

EDI is largely the result of user interest, much like MAP and TOP. Members of TDCC were companies like 3M Co., Boeing, GM and Hewlett-Packard Co. Almost 30 transactions have been defined or are under development by EDI.

Although EDI is a very rational approach to the problem of intercorporate business transactions, its adoption has been slowed by two factors. First, EDI is a family of standards. It is very ambitious — covering dozens of very different types of financial transactions. There is significant flexibility within each standard transaction type to accommodate the different needs of companies. Unfortunately, this may well cause problems for implementors.

In addition, software that implements EDI, such as inventory software, is not widely available. It will probably be early next year before we see a full range of products.

Major vendors' strategies

Several vendors dominate the U.S. computer markets, and all of them have developed or are developing strategic connectivity directions. These vendors view connectivity as the next battleground for major accounts.

The following are a few thoughts on the "Big Eight:" IBM, Digital Equipment Corp., AT&T, the regional Bell holding companies (as a group), Microsoft Corp., Lotus Development Corp., Ashton-Tate Corp. and Novell, Inc. This collection represents a good cross-section, with a slight bias toward the PC because of its huge influence on connectivity.

IBM is strong and getting

Continued on next page

OSI and etiquette of protocols

BY DAVID M. RAPPAPORT

A rule of etiquette is necessary to establish communications among computers. This rule is known as a "protocol," and the Open Systems Interconnect (OSI) reference model is an international suite of protocols that define computer roles and functions.

In business, computers must communicate with one another. Some rule is necessary to establish these communications: the communications protocol. A protocol is the body of rules that guides computer communications, covering the format of the message, the physical and logical interfaces between computers and contingency plans, in case of transmission errors.

The OSI reference model of communications is modularized into seven layers, each with an associated protocol. Each layer is defined by its communications functions and covers a specific part of the entire communications process.

Two different computers fully implementing the OSI standards for communications would each have software and hardware that corresponds to each layer of the OSI model. A message sent from one computer to the other would pass "downward" through all seven layers from the Applications Layer to the Physical Layer in the first computer. It would then travel through the network and enter the second computer, rising "upward" through the seven layers in that machine. This process is then reversed when the receiving computer responds.

The Application Layers are responsible for receiving the message from the sending program in the first computer and handing it over to the receiving program in the second. The Presentation Layers translate the message to and from the format used on the network, so the message is comprehensible to the sending and receiving programs. The Session Layers interact with each other to establish and control the dialogue between the two systems. The Transport Layers control the transmission quality and ensure that the network facilities are used effectively.

The Network Layers determine what route the data will take through the network. The Data Link Layers package the data for transmission and unpackage it on receipt. They also detect and handle errors in transmission. The Physical Layers establish the physical connection between the computer equipment and the network.

The major advantage of a multilayer protocol is the independence of each layer, enabling it to be changed without affecting the other layers •

Rappaport heads the telecommunications practice in the Management Information Division of Arthur Andersen & Co. This article was excerpted and adapted from *Trends in Information Technology*, Third Edition, 1987. Arthur Andersen & Co. All rights reserved.

Connection

FROM PREVIOUS PAGE

stronger. SNA is coherent, and extensions such as APPC, APPN and DDM, combined with enhancements to IBM's VTAM, promise a substantial gain in functionality.

It can be assumed that IBM will drive APPN and token-ring into every major account. In fact, a major groundswell of token-ring acquisition is already under way. IBM will also push the 9370 with its major accounts and emphasize 9370 connectivity to the full IBM product line. We can also look for diskless Personal System/2s to replace dumb terminals, further distributing IBM's processing power.

DEC also has to be considered as a player of the first order. Clearly, the company is no longer intimidated by IBM, and its announcement of SNA gateway software that runs on the IBM mainframe is just an opening shot.

DEC's connectivity strengths, its strong office automation, its willingness to design, install and service customers' LANs and its SNA gateway capability give it a powerful integration story.

Now the bad news. Hard-core, long-time DEC supporters still think better technology wins and, therefore, that enterprises should scrap SNA and convert to DEC's Decnet.

On ther other hand, Apple Computer, Inc.'s strategy for the future can be summed up in three words — connectivity and vertical markets. Apple devotes tremendous resources to connectivity and has done the best job, by far, of working with third-party connectivity vendors. Today, Macintoshes can be fully integrated into almost any LAN or SNA network as 3270-type terminals.

Apple may appear to have emphasized IBM connectivity to penetrate large accounts. But the truth is that Apple is focusing its sales efforts on DEC enclaves inside IBM shops. The logic is that if a department has broken ranks and purchased a VAX, it may be nonconformist enough to welcome Apple machines.

AT&T confuses having a bunch of products with having a strategy. In addition, its lack of a competitive sales force, product marketing, a stable management team and a focus has probably slowed its progress. Yet the firm has great potential. It could leverage ISDN, OSI and Starlan into a dominant position. But it needs to focus on connectivity and integration and rethink its approach to the business.

The regional Bell holding companies, by contrast, are lean and mean, and it is a good bet that some of them will become major systems integrators because they own all the wiring and central office equipment. And as integrated voice and data communications takes off, they could become the dominant suppliers.

Where the holding companies could blow their current edge is in emphasizing computer equipment sales, as AT&T has, or the Central Office LAN, or CO/LAN, which will be appealing to some Centrex users but certainly will not be the connectivity technology of the '90s.

In the meantime, don't let Microsoft's Excel for the PC distract you from what the firm is really up to. Clearly, Microsoft has noticed Apple's efforts with third-party connectivity suppliers and has decided, like Apple, not to reinvent every wheel. Watch out for Bill Gates and friends. MS OS/2 may just be an enabling technology

AT&T CONFUSES having a bunch of products with having a strategy. Yet the firm has great potential. It needs to focus on connectivity and integration and rethink its approach to the business.

to allow Microsoft to become your connectivity supplier from the bottom up.

Lotus presents a bigger question mark. The company has talked a good game, but what winners has it produced since 1-2-3? All that's here is a connectivity story — nice lyrics, but you can't dance to it.

Ashton-Tate remains a step behind Microsoft on connectivity relationships with third parties, but it better emphasizes adding host data base hooks. Put this one on the top-10 chart at No. 7 — with a bullet.

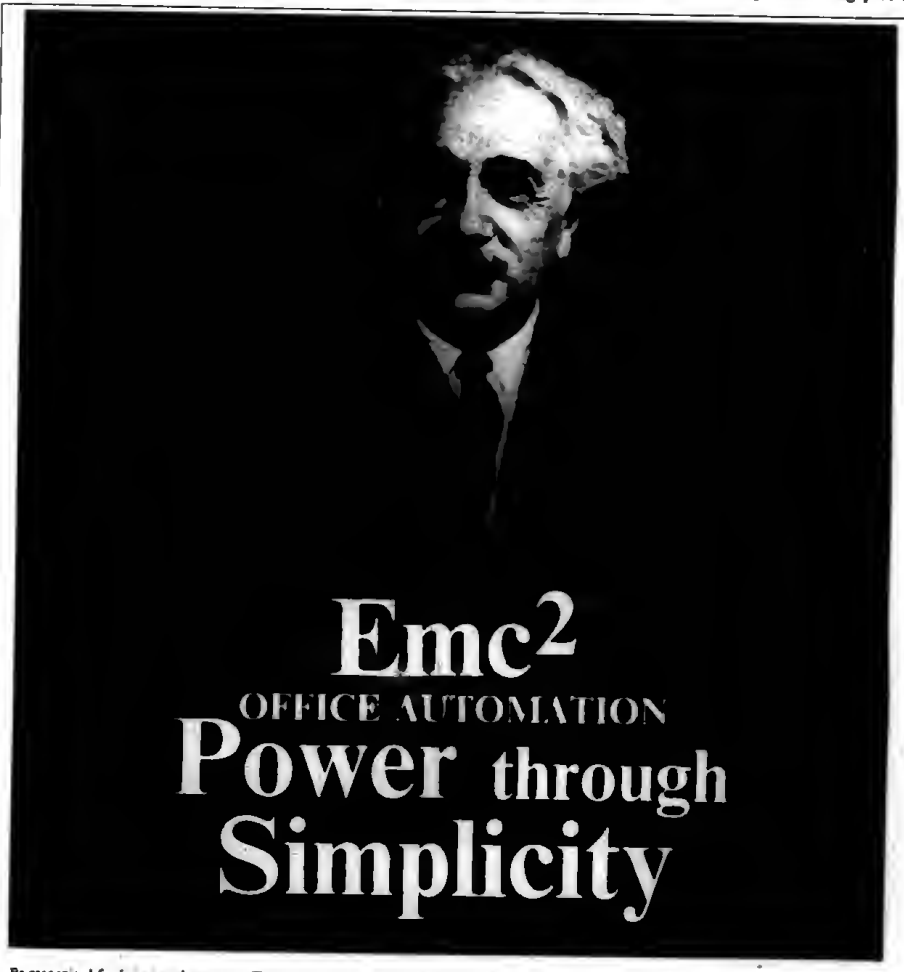
Novell is engaged in a different competition with the same adversary. Yes, it is worried about Microsoft. No, it is not frantic. It is willing to take on Microsoft and the OS/2 LAN Manager, but it doesn't understand or appreciate Microsoft's level of commitment to using OS/2 as a platform to capture the corporate connectivity market. Unless Novell wakes up, Microsoft will own a market in which Novell was a pioneer.

Megatrends

There are nine major, long-term trends in connectivity that are likely to facilitate the interconnection process:

- SNA and OSI will emerge as the two dominant standards and will be complementary rather than competitive in nature. Within the next few years, most major U.S. companies will make a strategic commitment to both standards.

The only reason we are not at this point today is that IBM North America, which has a major marketing problem,



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already told us, "SNA is the present and the future." IBM Europe, however, has embraced OSI, albeit reluctantly.

Large corporate SNA and OSI networks will be routinely interconnected via gateways. But the interfacing of SNA and OSI will be nontrivial and resource-intensive. By some estimates, a small DEC Microvax or a large PS/2 may be required to handle the full mapping of SNA to OSI and vice versa.

• APPC will emerge as the standard programming interface for both SNA and OSI.

Companies will prefer to develop a single application that can run both in SNA and OSI environments. This can be accomplished only if the application uses a single call structure for interprocessor communications. The availability of APPC and its general acceptance have made it the natural selection. And it is clear that the ISO, the parent of OSI, is giving APPC serious consideration as part of OSI.

• ISDN will emerge as a major force in the industry and will greatly accelerate information exchange.

ISDN will provide high-speed wide-area networking at cost-effective rates. Most people emphasize the integrated service aspects of ISDN — voice, data, image and so on — but in reality, ISDN will be of greatest practical benefit to corporate MIS as a cheap T1 line for data. Consequently, ISDN will sharply increase the volume of data transferred.

ISDN may also give aging 3270 terminal networks of medium-size and large companies a substantial mid-life performance kick. And any technology that is supported by the PTTs, AT&T and IBM will be successful.

• LANs will be the dominant local connectivity architecture. The momentum behind LANs is strong. They have become an accepted technology, with most companies having successfully completed their prototype installations.

In the next several years, LANs will become the dominant local architecture for computer connectivity. Thanks to very large-scale integration technology, within a few years most computers, particularly PCs and departmental processors, will come with at least one integrated LAN port.

One burning question is what will happen to the independent LAN vendors that sell large corporate LANs when most new devices are manufactured with built-in LAN adapters. What will LAN vendors have to sell then? What value can they add to keep their products viable? The probability is that they will either be acquired, go out of business or evolve into broader solution suppliers or systems integrators.

Another, more critical, issue is how to tackle management and maintenance of these large-scale entities. Little study has been done on the care and management of very large LANs.

• Twisted-pair will be the dominant local connectivity media.

Twisted-pair makes LANs significantly more attractive because of the reduced cost and ease of installation. Consequently, twisted-pair will lead to an increase in LAN installations.

However, as strategic commitments are made to LAN technology, old twisted-pair wire will be pulled, and new — shielded — twisted-pair wire will be installed. Broadband and fiber will also play major roles as backbone technologies.

• Micro-to-mainframe connectivity will continue to evolve rapidly toward the "3ML" or micro-mini-mainframe links.

MOST PEOPLE emphasize the integrated service aspects of ISDN. But in reality, ISDN will be of greatest practical benefit to corporate MIS as a cheap T1 line for data.

Micro-to-mainframe links have been constrained by several factors, such as a drastic oversupply of vendors. These constraints, which also include slow networks, user reluctance and weak interfaces, are being remedied. The rapid growth of departmental processors has led some link vendors to develop strategies to extend their products from mainframes to minicomputers and vice versa. The resulting products are 3MLs.

These links are strategically important because they support end-user access to both mainframe (IBM) and departmental (DEC and IBM) resources through a single interface.

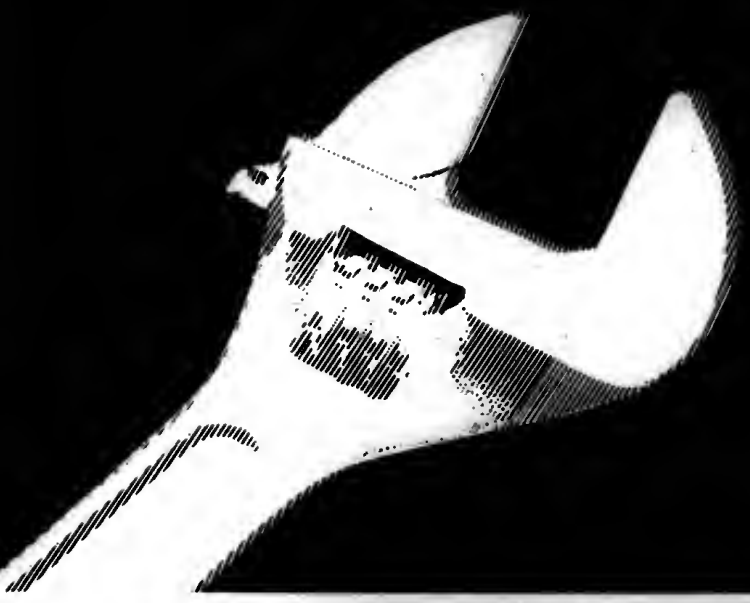
• Gateways will be widely used and considered a basic building block — the Crazy Glue — of connectivity.

Most medium-size and large corporations will use multiple LAN protocols with multiple media. Companies will expand their already significant commitment to SNA and make commitments to OSI.

Additionally, X.25 will continue to be a growing force. To achieve the full interconnection of these different protocols, companies must employ gateways — although gateway is still a dirty word to many die-hard MIS managers. What we really need here is a new name — like "interprotocol transport mapping server" — to hide it.

• Enabling applications will give users a sophisticated set of distributed services. These services will include data transformation, distributed data dictionary,

What our manufacturing clients will tell you about N.E.T. T1 networks:



distributed data base management, document interchange, heterogeneous data base support, virtual terminal support, E-mail and open-content or compound documents.

Achieving full connectivity will be valuable to the corporate user only if there are such enabling applications, which allow users to easily access and use remote, dissimilar resources.

The emergence of SNA/APPC and OSI will allow software vendors to develop these applications, and the fully interconnected networks that we will see in five to 10 years will seem to the end user to be a single, integrated resource — an extension of his own computer environment.

• The need for integrated network management software will become a major strategic concern for the corporation.

THE FULLY interconnected networks that we will see in five to 10 years will seem to the end user to be a single, integrated resource — an extension of his own computer environment.

The fully interconnected network will require fully interconnected network management; this means products that manage security, performance, accounting, audit trails, diagnostics, operations and user support.

IBM's Netview is a platform for building these types of solutions. DEC is also devoting an enormous amount of resources to network management software development, but Netview will be the central building block for most Fortune 2,000 companies.

Closer to home

Megatrends are interesting to contemplate and should drive strategic connectivity planning. But users want solutions *now*, which means we must make tactical connectivity decisions *now*. It may be helpful to look at the increments behind some of those major movements.

Here is the way technology promises to evolve in the next year, the next three years and the next five years.

Through 1988, we can expect PC-to-host file transfer to continue to explode but on a different terrain. It will move into background processing with the adoption of OS/2. In addition, IBM 9370s on Token-Ring networks will surprise the doubters and become a major configuration for work-group LANs.

Most regional holding companies will deploy some beta-test ISDN facilities, although most will be primarily used for existing voice applications. T1 prices will drop substantially, to as low as $5,000 for a three-year contract on a 500-mile circuit.

OSI products will begin to emerge, as will high-speed, IBM channel-to-LAN products to support high-speed bulk file transfer. Finally, host batch report writer technology will be integrated with departmental processing, allowing departmental applications to be easily populated with extracts of host data.

Within three years, the basic building blocks will be available. LANs will become the dominant data communications pathway, with 80% of all corporate workstations connected via a LAN. Twisted pair will be the dominant LAN media, with fiber as the dominant backbone.

SNA and OSI will emerge as the dominant standards; SNA/OSI gateways will be commonplace. Host terminal users will routinely cross from SNA onto LANs or across the network.

T1 will be widely used to connect departmental processors to mainframes for high-speed file transfer. Heterogeneous data base access products will emerge, using AI technology to manage the diverse data structures. And the first distributed data dictionaries will appear.

In five years, all the major pieces of corporate connectivity will be in place with available products. ISDN will emerge as the dominant wide-area backbone, providing high-speed data transfer at reasonable rates. Also, 100M bit/sec. fiber will be commonplace, substantially improving the capacity of LAN backbones, and end users will routinely transfer 100M bytes of data.

A wide variety of end-user applications will emerge capable of creating the illusion of a meta-operating system.

In other words, we will have reached the point at which, from the end user's perspective, the fully integrated network appears as a single resource and a natural extension of the workstation environment.

Although all of this looks very neat and tidy when laid out in time chunks, the reality is, and will be for some time, messy, fragmented and confusing. We are venturing into largely uncharted territory once we start searching for large-scale logical connectivity.

Among the unresolved issues are these: how to perform DEC-to-IBM integration beyond the terminal emulation stage; how to extract, subdivide and reformat data from remote and dissimilar computers; and how to manage the very big LANs that most large companies are already planning.

There are no road maps for any of these areas. But if we had wanted road maps, we probably wouldn't have started down this path in the first place. •

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A network manager never sleeps

BY G. BERTON LATAMORE

Network management is a 24-hour, seven-day-a-week job, the hardest part of which isn't solving technical problems but handling pressure, according to Marc Malacoff, network manager at The M. W. Kellogg Co., an international engineering and construction company based in Houston.

"I've had days when my beeper went off 16 times before I could get off the freeway and get to a phone," he says. "As long as the network is up and functioning, it's fine. But when something's wrong, everybody comes at you from different angles."

Malacoff is currently managing two networks for Kellog — an all-purpose home-office local-area network (LAN) and a second, smaller, LAN added this year for use by the engineering department. The home-office network is a complex creation. It is primarily a Bridge Communications, Inc. Ethernet Network with 59 nodes. It supports 11 Digital Equipment Corp. VAXs, four IBM Systems Network Architecture gateways, a Hewlett-Packard Co. HP 5000 used for project control, 500 terminals, more than 100 printers and more than 500 IBM and Compaq Computer Corp. personal computers and Intergraph Corp. Interact engineering workstations.

Both networks are tied to the corporate IBM mainframe data base in a separate building by a T1 trunk line. In Houston alone, nearly 1,000 user names reside in the VAX environment, and approximately 200 are on the mainframe environment. The Ethernet backbone primarily uses the Xerox Network Systems protocol, but other protocols such as DEC's DDCMP and LAT are also present.

Protocol changes, however, are invisible to the user. If users want to run an application on the VAX in London from a PC in Houston, they just log on and tell the system, "Host — London," and they are connected.

While Malacoff has help with day-to-day maintenance tasks, as the network's creator, the main burden of support belongs to him. The burden is heavier of late, because the amount of network traffic has increased. During the last year,

> "I'M SPENDING more time on the phone telling people I'm fixing the problem than using the soldering iron to make the patches."
>
> MARC MALACOFF
> THE M. W. KELLOGG CO.

Kellogg's home-office Ethernet network became the backbone of company operations faster than anyone had expected, Malacoff says.

Like all construction companies, Kellogg, which specializes in petrochemical plants, has suffered from the ongoing worldwide slowdown in large-scale construction. To survive, it had to cut staff while increasing productivity. The network has become a critical part of the exchange of information in the normal flow of the operations of the business. If the network fails, productivity drops; and in an engineering environment, failure can have a domino effect.

Everyone at Kellogg, from clerical workers to top executives, is tied into the network. Any task in the company that can be done on-line is — from text and transaction processing and electronic mail to heavy number-crunching. This integration has increased productivity throughout Kellogg, but the improvement is most pronounced within the company's engineering sector. Kellogg's engineers are now able to execute in three days number-intensive design work that used to take at least a week.

Using Compaq Deskpro 386s and Interact workstations connected through the second, separate Ethernet link to the main network, the engineers can exchange information — both in Houston and remotely — as well as access data and the number-intensive processing capabilities on the Houston mainframes and VAXs. This direct connection to data and processing power eliminates the middleman in the engineers' work, thus effectively reducing the number of computer hours and man-hours needed to complete design work.

While staff size remains stable, the network load is growing. On this smaller network alone, Kellogg has already added six 456M-byte hard drives to its DEC Vaxcluster, for a total of more than a dozen. In addition, approximately 12 terminals go

Latamore is a Burlington, Vt.-based free-lance writer.

on-line each month. "If you add up all the ports, regardless of the device, plus add on the virtual ones on the host side, there are more than 1,200 LAN ports," Malacoff says. "That's 1,200 configuration files to keep track of." Then, too, as the network has become more complex, so has troubleshooting. "If the network goes down, it could be a hardware problem, a software problem or a network problem. Sometimes three or four people are buzzing around one workstation," he adds.

Automation is coming late to network management at Kellogg. The company just added a Compaq 286-based Bridge network control server that offers problem determination, capacity planning and analysis tools. If Malacoff suspects a server is failing, for instance, he can have a PC note the status of its condition every five minutes. After three hours, he can look at the results and identify the problem.

Tie-ins to Houston

Malacoff's responsibilities do not end at headquarters. Kellogg has offices in London and Singapore and field offices at large construction sites from Pennsylvania to Perth, Australia. All of the locations are connected to Houston using McDonnell Douglas Network Systems Co's Tymnet International division's dial facility, DEC's Decnet for connections between VAXs at remote sites and IBM's RJE, for connections from remote sites into mainframes. "I don't manage those parts of the network, thank goodness, but I work with them," Malacoff says.

At the moment, for instance, he says he is working out the details of the best method for staff in Singapore to dial into the local-area network in Houston. Staff members will dial a local number in Singapore, get into International Tymnet, route into the IBM 3725 mainframe in Houston and then into the Houston VAX.

"This ability to communicate has a major positive impact on exchanging information on a regular, constant, timely basis despite wide time differences between the worldwide sites and home office. You can send a copy of a document, see if the person it was sent to has read it, get responses back, and you're not waiting on the U.S. Postal Service, DHL, Federal Express or telex.

"The information can go back and forth several times, if necessary," Malacoff explains. "Therefore, problems that need to be resolved by home-office management are being handled more quickly. In fact, many people in the procurement department who travel a lot carry portables and dial into their mailboxes from wherever they happen to be."

Foreign connections

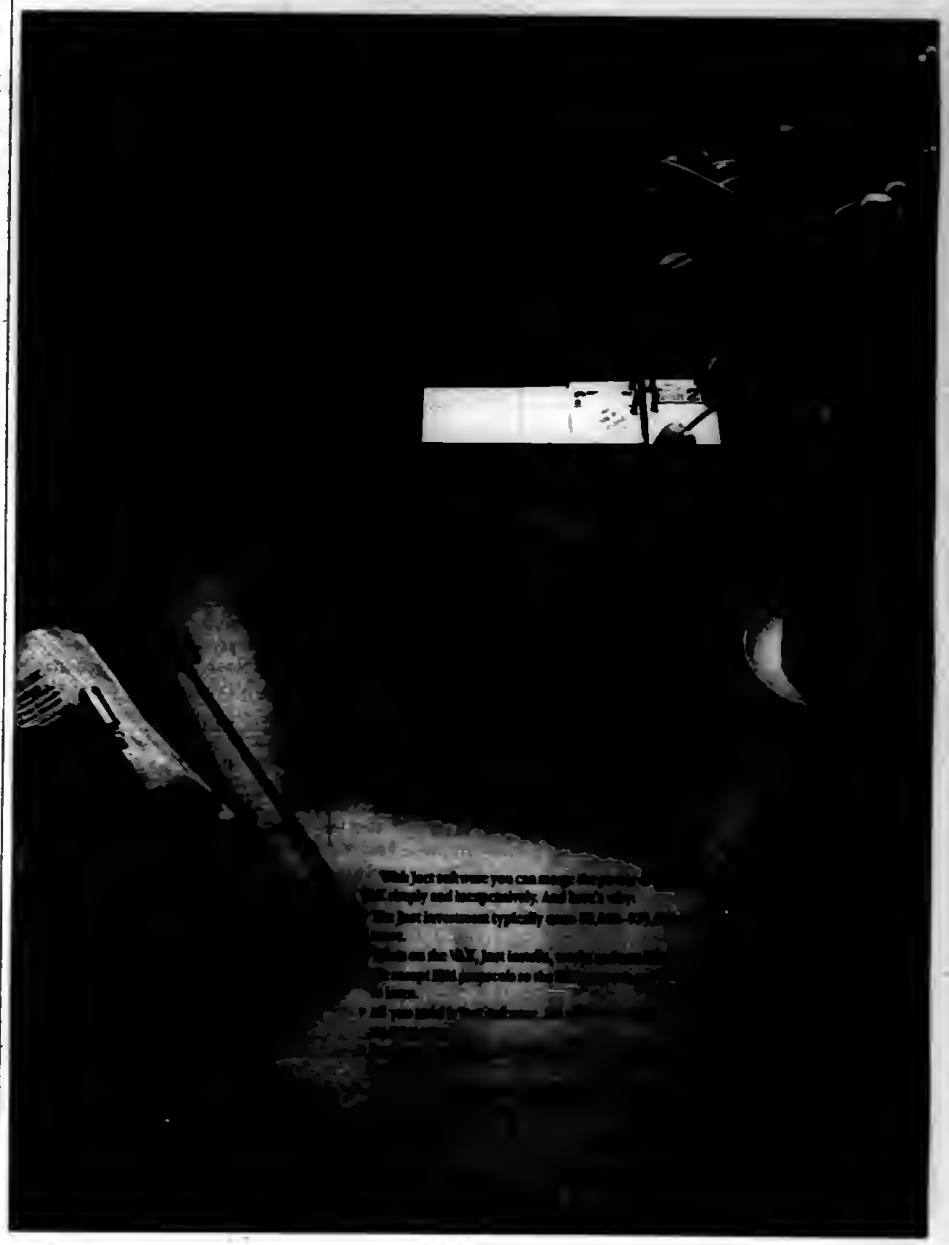
Malacoff is often involved in setting up data communications at field sites. Sitting in Houston making overseas calls, trying to gather important details and deal with U.S. and foreign export and import regulations can be frustrating, be admits.

For instance, several years ago Kellogg was involved in a collaborative operation in Dusseldorf, West Germany. The West German government wouldn't let the company bring modems into the country; instead, the company had to buy them through the government. So Kellogg was held up waiting for the West German authorities to complete the paperwork.

"It's difficult to get other people to understand why you're waiting for foreign governments to tell you their telecommunications requirements," Malacoff says. "There's an enormous amount of tedious, time-consuming research. It took us three months to get a PC working on-line in Santiago [Chile]. Sometimes it's hard to get things up in time to be useful for someone who will be there a limited amount of time."

Often, the biggest problem for Malacoff, he says, is handling frustrated users while getting his job done. "There I am in the computer room trying to patch a cable that had been cut," he explains. "The floor tiles are up, the wind is blowing up my pants legs, and I'm freezing to death. Every two minutes someone calls to ask when the network will be up. I'm spending more time on the phone telling people I'm fixing the problem than using the soldering iron to make the patches." •

Marc Malacoff *of M. W. Kellogg Co.*



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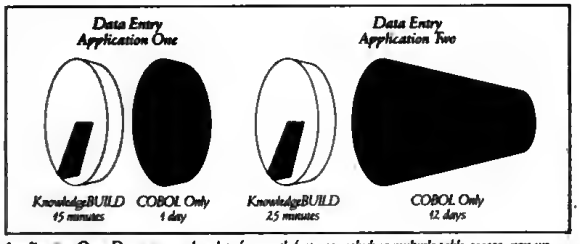

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The transformation of the cultural connection

BY THOMAS B. CROSS

"The velocity of communication is the velocity of change," writes Craig Blackman of Christian Brothers College in Memphis in his book, *Chief Technology Officer*. "How fast and accurate we communicate and how the velocity changes as we move from a 'paperful' office to a 'paperlessful' office will also change the way we think about our organizations and, more importantly, the way they are structured."

As new computer communications tools find their way into organizations, they change not only work flow patterns, but also basic structures and attitudes. Micro-to-mainframe connections have decentralized the control of information power and, as a result, have transformed the way managers and workers think about their roles. From top to bottom, it is at least theoretically possible for everyone to have access to the same information.

The concept of information is also changing. If you only have numbers to work with, you think in those terms. If you spend most of your time communicating, you think in terms of systems that can help you communicate better. New technologies, such as blackboard systems, neural/semantic networks and other forms of artificial intelligence that allow people to work and think in their own terms, are now emerging.

Aside from disagreeing about what constitutes information, various departmental cultures have differing views on how it should be used.

These differences are largely a function of the piecemeal way data is currently distributed. Although each group believes the others see what it sees, this is seldom the case. Given the rate at which connectivity is advancing through firms, however, that currently mistaken assumption may soon become a true one.

Computer communications are changing how we see knowledge and what we can do with it. Corporate culture is changing as a result of this. Executives can prepare their own briefings without having to wait for someone else to generate reports or cope with another person's interpretation of the facts.

Local-area networks (LAN) are changing work groups as well. Without such connections, workers can retrieve data from the corporate mainframe but are limited in the extent to which they can share it. Managers are responsible for keeping their subordinates focused on work but often have few tools to keep everyone up-to-date and on schedule.

CONNECTIVITY allows corporations to rethink what they are and what they can be and to dynamically adjust their thinking and procedures.

LANs emerged to link workers together in many ways. Ideas that once lay dormant can now be shared with large numbers of people in distant locations. "Our management team is sharing more ideas and information while expending less time in the process," says Edward J. Coia, vice-president of the Federal Reserve Bank of Philadelphia, where a three-year-old LAN links three divisions and supports both local and remote access.

The corporate culture has shifted even more with laptops and remote access to mainframe computers and LANs. The shift is subtle but significant. "Work can be done anywhere," says Peter Dallow, director of administrative services for the City of Fort Collins, Colo., where all city council members are equipped Hewlett-Packard Co. laptops for remote access to a central HP300 via a Northern Telecom, Inc. SL1 switch, and where city workers participate in one of the most extensive telecommuting operations in the country.

Dallow says the city's commitment to telecommuting, and connectivity in general, produces both better service for citizens and better employee attitudes. "People who have access to information through communications technology can see more clearly — and for themselves — what is happening," he says. "While there is more vertical communication, there is also much more lateral information sharing, and things happen more quickly."

Connectivity allows corporations to rethink what they are and what they can be and to dynamically adjust their thinking and procedures. As Blackman notes, "Rather than those that are the largest, those corporations that can change rapidly are those that will be the most successful." ●

Cross is vice-president of Cross Information Co. in Boulder, Colo., and the author of several books on communications.

"Computerworld's BUY-SELL-SWAP section is this industry's Yellow Pages."

— Phil Thomas
Thomas Business Systems

Phil Thomas is President of Thomas Business Systems of Boca Raton, Florida. Thomas Business Systems buys, sells and leases new and used IBM, DEC and Data General equipment. They've been doing so for 10 years.

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COMPUTERWORLD
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Building data communications to flex strategic muscle

BY MICHAEL JASKOLKA

Bankers Life Insurance Co. of Nebraska is a company that takes an aggressive and innovative approach to current technology. We believe information technology has never been so critical to business success as it is in the insurance industry of today.

Data communications, in particular, has become a major competitive weapon. It provides the channel for distributing new products and services to a firm's consumers and to the expanding base of market representatives, which includes independent insurance agents, stockbrokers and investment bankers. Organizations that provide an electronic link through communications networks will enjoy a strategic edge.

Bankers Life is a financial services organization with assets of more than $1 billion and more than $5 billion of life insurance in force. It is also a company that is planning for significant growth. Our goal is to expand our current marketing base outward from the roughly 70 field agencies that sell Bankers Life products and services on an exclusive basis to an ever-widening circle of independent marketers — 100 this year and another 150 next year.

These growth plans created the need for flexible, inexpensive and efficient communications networking and led us to develop a communications system that currently provides central computer-initiated dial-out connections to remote asynchronous devices. This will soon be expanded to include remote personal computer-to-host communication.

As we began considering ways to approach the company's growing population of field offices and their communications needs, we found that we could not cost-justify end-to-end Systems Network Architecture (SNA) communications. The special SNA circuit boards and synchronous modems were too expensive, and users still needed asynchronous modems to access other networks and data services.

Furthermore, Bankers Life anticipated that the majority of the organizations we would be tapping as independent marketers for our products and services would have asynchronous communications capabilities. We were concerned about preserving maximum flexibility in that regard.

Asynchronous communications using serial connections (RS-232 interfaces) can connect desktop computers and any type of PC, from laptops to Intel Corp. 80386 machines, with any type of delivery services, from private-branch exchanges (PBX) to packet-switched networks, using the CCITT X.25 protocol.

Night cycles

Unattended overnight communications for uploading and downloading files was a major requirement for the data communications network. The store-and-forward autoanswer unattended mode for overnight data transmission provides a cost-effective and efficient data communications service and simplifies the delivery of data between our computer center and remote users.

Overnight communications takes advantage of the low off-peak rates charged for both network use and host processing. This eases the pressure on the daily work load, both at the central host and remote sites by allowing the user to defer transmission of time-intensive material to evening hours.

AFTER NEARLY six months in operation, the system of direct communication links developed by Bankers Life to support the requirements of its expanding force of field agencies and other marketing arrangements has already proven itself in terms of both savings and efficiency.

At night, business data collected throughout the day is uploaded from all field offices to the mainframe. This data includes new business application entry, electronic mail, in-force ledger illustrations and policy inquiries, new business status requests and other correspondence.

At the end of the nightly processing cycle, a second dial-out is initiated for download-transmission of correspondence such as production reports, pending status reports, illustrations and policy inquiries.

Our first approach for autoanswer unattended overnight data communications consisted of two components: PC-to-PC communications, using Hayes Microcomputer Products, Inc. Smartcom software for home office-initiated remote dial-out communications; and micro/mainframe data exchange, using IBM file-transfer software.

Jaskolka shows off *Bankers Life's strategic arsenal*

In late 1986, we started to develop a PC-based communications program to replace the Smartcom software. This program, which is the foundation of our current communications capabilities, has the ability to terminate the remote PC communications program and print the data sent to disk at the remote field offices.

Thus, when office personnel arrive in the morning, all the reports, E-mail and other correspondence are printed and ready.

The automated shutdown and off-hours processing of time-consuming printing jobs frees both personnel and equipment to accomplish other tasks during business hours.

The PC communications software supports originator as well as answerer functions of file transfer for up-line and down-line loading.

Software initiation parameters such as speed, parity, number of stop bits, communication port selection, disk drives and path definitions are defined in an autolog communications command file.

Other supported features include direct modem connection or PBX modem pooling, interrupt-driven ring and carrier detection or polling mechanism, debug trace option and batch communications set selection.

For automatic and simplified startup, these parameters can also be dynamically passed in the program execution command line. When the command line option selection is included, the manual menu selection process can be bypassed.

Additional program functions include interactive Teletypewriter-emulation command capabilities, which can be used for development, testing and debugging; modem initialization and setup commands using a Hayes command set; and batch communications sets definition.

The number of communications sets or the number of locations in each communication set are unlimited. Each entry in a communications set contains the location name, telephone number, active or inactive flag, local and remote data set name, password information and communications commands.

Planned enhancements include IBM PC-DOS commands, an interactive program fix application and remote program interactive execution.

On our own

Our next challenge, after the development of our own PC communications program, was mainframe software for dial-out initiation. After searching three years, we finally concluded that outbound dial capabilities for asynchronous communications did not exist on mainframes and that we would have to create it for ourselves.

Our primary requirement for this segment of our communications plan was end-to-end reliability for error detection and retransmission.

To handle the multiple environments through which data would be traveling, we defined block-mode asynchronous protocol that uses cyclical redundancy check (CRC) algorithms, the same as those used in synchronous and high-level data link controls (SDLC and HDLC).

Each block would be able to transmit a frame that was 512 bytes long and, with the CRC checking any type of data (including binary files such as programs and spreadsheets) could be electronically transmitted, allowing us to perform software distribution through data communications.

Once we determined that what we had envisioned could be achieved, we purchased an IBM 3708 converter for SNA-to-asynchronous bridging. Using the protocol-enveloping feature of the 3708, we were able to accomplish an asynchronous dialogue through Hayes modems to the remote locations.

The technical staff at Bankers Life initially wrote a host-based CICS application. Enhancement plans include the development of a native VTAM application.

The homegrown code uses a CICS-based application with Applied Data Research, Inc.'s Datacom/DB-based data base using IBM's VTAM and NCP with a 3725 communications controller and a 3708 connected to it.

Connected to the 3708 access ports are Hayes modems, which are, in turn, connected through an analog interface to a Rolm Corp. computerized branch exchange (CBX).

Room to grow

Currently, we are using four modems for the company's overnight communications. The only factor limiting the number of concurrent transmissions we can have is the number of trunks currently connected to our CBX, which is 27. Thus, Bankers Life has tremendous growth capacity as well as the use of the same facilities utilized during normal working hours for voice, at significant cost savings.

Since all of the calls are long distance, it is essential that we use the most economical solution. The least expensive routing feature of the CBX provides the most economical method of communications as well as generating the necessary management information.

Taking advantage of the CBX also reduces communications costs by eliminating direct-distance dialing charges.

The host program handles the dynamic terminal selection and acquisition, dynamic data set allocation and deallocation, Hayes modem initialization and the setup and dial transmission initiation.

The mainframe program

Continued on page S32

Jaskolka is assistant vice-president of information services at Bankers Life Insurance Co. of Nebraska.

Bridge products

Advanced Computer Communications, Inc.
(805) 963-9431
ACS 4030
Links geographically separate Ethernet or Cheapernet local-area networks (LAN). Allows selective host access on a LAN-by-LAN basis. Supports transparent, full-duplex transmission across multiple links, allowing for load balancing and network optimization. Also supports low-speed modem interfaces from 2,400 bit/sec. to 19.2K bit/sec.; higher speed modems up to 64K bit/sec. can also be accommodated. Features include dynamic updating of routing tables, static updating, local and remote traffic filtering and password protection.

Bridge Communications, Inc.
(415) 969-4400
IB/1
A broadband-to-broadband internetwork bridge that provides protocol-transparent routing. Interconnects a standard Ethernet (IEEE 802.3) and Bridge's 5M bit/sec. carrier-sense multiple access with collision detection (CSMA/CD) broadband network to form an extended campus hybrid network that covers a radius up to 10 miles. Continuously monitors traffic on the local-area network (LAN), filters and discards messages addressed to local stations and forwards any inter-LAN packets.

IB/2
Can be used as a local or remote bridge. Configured as a logical bridge, it joins two Ethernet networks with standard transceivers and transceiver cables. As a remote bridge, it works with Bridge's fiber-optic transceiver and fiber-to-coaxial repeater, covering a distance of up to 1.5 km. Multiple high-speed Motorola, Inc. 68000 processors allow the bridge to filter local traffic at more that 7,000 packet/sec. and forwarded internetwork traffic at up to 2,500 packet/sec.

IB/3
A protocol-transparent remote bridge. Supports up to eight synchronous communications lines, including T1. V.35, RS-422 and RS-232 with an aggregate speed of 4.1M bit/sec. Maintains extensive statistics and makes reports available on monitor or network control server.

Network manager can display throughput information about IB/3, local Ethernet network and each communications line supported. Automatically filters local traffic and provides generalized filtering to isolate excess internetwork traffic and protect network security.

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DRN-3100 Bridge
Connects two Ethernet local-area networks and provides transparent connection for devices on each network. Dynamically builds and maintains routing and address tables, operates at the data-link layer and passes Ethernet packets that contain any higher level protocol at up to one-third of the total Ethernet bandwidth. Uses include extending the distance limitation of the Ethernet and load leveling between departmental networks.

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Series 4100 Broadband-to-Carrierband Bridge
Allows users to connect manufacturing automation protocol (MAP) carrierband subnetworks to broadband backbone networks. Provides RS-232 or RS-449 synchronous, full-duplex data link between the two MAP media. Local traffic is forwarded using configurable filters and IEEE-802.4 recommended hierarchical addressing.

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Links Ethernet/IEEE 802.3 networks across an IEEE 802.4 broadband backbone. Baseband-configurable for Ethernet (including thin Ethernet) or IEEE 802.3. Includes integrated, frequency-agile broadband modem. Uses configurable filtering and provides console port for local and remote management. Ideal for large manufacturing enterprises with multiple Ethernet segments.

Digital Equipment Corp.
Contact local DEC sales office
LAN Bridge 100
Interconnects two or more Ethernet local-area networks (LAN) creating an extended LAN. Operates at data link layer and is protocol-independent. Uses a store-and-forward feature to receive, regenerate and transmit packets.

Microwave Bridge
Contacts two geographically separated Ethernet local-area networks (LAN) within a metropolitan or campus environment in which cable is neither feasible nor economical. Connects two Ethernet LANs separated by streets, highways and waterways. Transparent to the user, the bridge provides high-speed transmission via a 23-GHz wideband, duplex, frequency-modulated microwave link across line-of-sight distances of up to 4½ miles.

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(513) 433-2238
10-Net RS-232 PC Remote
Enables an IBM Personal Computer, PC XT, AT or compatible in a remote location to become part of a 10-Net local-area network through use of asynchronous Hayes Microcomputer Products, Inc. Smartmodem 1,200 or 2,400 bit/sec. or compatible. Features include data sharing, user-to-user communications and use of all standard 10-Net utilities such as security, electronic calendar, electronic bulletin board, electronic mail, printer spooling and remote job submission.

10-Net RS-232 Bridge
Enables communications between two 10-Net local-area networks through the use of an asynchronous Hayes Microcomputer Products, Inc. Smartmodem 1,200 or 2,400 bit/sec. or compatible. Features include data sharing, user-to-user communications and use of standard 10-Net utilities such as security, electronic calendar, electronic bulletin board, electronic mail, printer spooling and remote job submission.

Gandalf Technologies, Inc.
(312) 459-6630
Starmaster
Provides traditional statistical multiplexing on 9.6K bit/sec. to 64K bit/sec. composite links for wide-area networks. Features include preferred routing paths, time division multiplexing and direct umbus connections.

Gateway Communications, Inc.
(714) 553-1555
G/Remote Bridge
CCITT X.25-based Novell, Inc. Netware local-area network (LAN)-to-LAN remote bridge. Enables user to connect any Netware LAN to any other Netware LAN as if they were logically attached, regardless of topology or distance. Users can connect up to 32 remote LANs across X.25 trunk lines, public or private data networks. Board-resident software performs X.25 data packetization and message accumulation. Supports transmission speeds up to 19.2K bit/sec. per communications port.

Hewlett-Packard Co.
Contact local HP sales office
HP 10M bit/sec.-to-10M bit/sec. LAN Bridge
Provides interconnection of IEEE 802.3/Ethernet local-area networks (LAN). Listens to all traffic between the two LAN segments interconnected and inspects source and destination addresses to decide whether the traffic must be forwarded. Dynamically updates routing tables, filters communications traffic and extends networks up to 10 miles.

Infotron Systems Corp.
(609)424-9400
LAN Span Bridge
A local-area network-to-wide-area network bridge. Operates on the data link layer and supports any protocol that adheres to IEEE 802.3 or Ethernet Version 2. Supports V.35, RS-449 and Conference of European Postal and Telecommunications (CEPT) links from 56K to 2.05M bit/sec. Provides management and control functions via a single-console, menu-driven format. Network information includes configuration detail, port utilization, port statistics and link diagnostics. Features include custom filtering and two levels of security.

Lanex
(301) 595-4700
Media Access Control Layer Bridge Model 8023
Connects physically separate IEEE 802.3 local-area networks. Each of two ports can be configured for Ethernet, Starlan or fiber-optic interfaces allowing various departmental Ethernets to interconnect via a broadband or fiber-optic backbone. These multiple subnets become one logical IEEE 802.3 network. The Adaptive Address Filtering Technique maximizes performance and bandwidth utilization, and the broadband or fiber-optic backbone allows for distances between Ethernets to span several miles.

Netways, Inc.
(516) 361-7585
Netways Bridge/Plus
Connects any combination of Ethernet, Starlan and Cheapernet local-area networks in either local or remote applications. Offers CCITT X.25 bit-oriented link access procedure (LAP-B) remote links at T1 rates, 10M bit/sec. fiber-optic link, data encryption on remote links and security filtering.

Novell, Inc.
(801) 379-5900
Netware Asynchronous Bridge
Provides transparent internetworking between two Novell local-area networks, whether local or remote. Features include dynamic updating and filtering of routing information or tables. Requires 256K bytes of random-access memory and runs at a speed of 19.4K bit/sec.

Retix
(213) 399-2200
Retixgate 2244 Bridge
A two-port IEEE 802.3 media access control (MAC) Bridge that connects homogeneous or heterogeneous IEEE 802.3 networks (Starlan, Ethernet, thin Ethernet). Can be used to interconnect two networks, either directly or through a high-speed backbone network. Monitors all packets on the connected local-area networks, continuously records the source addresses of MAC frames and maintains a table of active MAC addresses.

TRW, Inc.
(213) 373-9161
NB2000 Bridges
Provides connectivity between IEEE 802.3-format local-area networks of various media. Protocol transparent routing is based on Ethernet addresses, permitting interconnection of mixed protocol networks such as Transmission Control Protocol/Internet Protocol, Xerox Network System, Digital Equipment Corp.'s Decnet or ISO. Local and remote configurations are available for transparent interconnection across a wide geographic area. Routing tables and performance statistics may be accessed through an optional RS-232C serial interface or through the TRW Network Management System.

Ungermann-Bass, Inc.
(408) 496-0111
Net/One Data Link Bridges
Provides Ethernet-to-Ethernet or token-ring-to-Ethernet connectivity. Available in local or remote models. Provides protocol-independent routing of data packets between multiple types of local-area networks. Allows multiple protocols such as Xerox Network System, Transmission Control Protocol/Internet Protocol, ISO and Digital Equipment Corp.'s Decnet.

Net/One High Speed Remote Bridge
Can be configured to support data link speeds from 4.8K bit/sec. to 2.05M bits, including T1 speeds of 1.54M bit/sec. Allows a large number of Net/One users and attached devices to access the telecommunications link simultaneously.

Net/One Local Bridge
Provides high-speed store-and-forward interconnection of multiple Net/One networks in the same geographic location. Extends the length and topology of Net/One networks, independent of media. Different models connect Ethernet IEEE 802.3 baseband, fiber-optic baseband and broadband.

Vitalink Communications Corp.
(415) 794-1100
Translan
A protocol-independent data link layer bridge that logically extends the local-area network (LAN) cable across the wide-area network. Interconnects LANs regardless of differences in station capacity, network architecture or higher level protocols. Supports all Ethernet protocols including Digital Equipment Corp.'s Decnet, Xerox Network System, LAT, Transmission Control Protocol/Internet Protocol and DS-1. Interfaces with any terrestrial or satellite transmission link, with data transmission capacities from 9.6K to 2.05M bit/sec. Network management capabilities give operator full visibility and control of all network functions from a central control terminal or from terminals distributed throughout the network.

Gateway products

COMPANY	PRODUCT	LINKAGES SUPPORTED	EMULATION PROVIDED	SUPPORTS MAINFRAME APA[1] GRAPHICS	RAM[2] REQUIRED BY GATEWAY	RAM REQUIRED BY EMULATION	LINE PROTOCOLS	MAXIMUM NUMBER OF SIMULTANEOUS SESSIONS	NUMBER OF DISPLAY SESSIONS	NUMBER OF PRINTER SESSIONS	SUPPORTS WHAT LAYER OF OSI/SNA	LINE SPEED (BIT/SEC.)	PERMITS MULTIPLE GATEWAYS ON A NETWORK	STATIC/DYNAMIC ALLOCATION OF SESSIONS	PRICE
Adacom Corp. (913) 888-4999	LG 700	Any LAN[3] or WAN[4] to IBM 3270	3101, 3163, 3270 Models 2, 3, 4, 5, VT 100, VT52, ADM34	No	NA	64K	Proprietary, asynchronous ASCII	16	16	16	NA	19.2K	Yes	Static	$7,500
Advanced Computer Communications, Inc. (805) 963-9431	ACS 4020	TCP/IP[5] Ethernet to CCITT X.25 Public Data network or X.25 Defense network	Transparent	Transparent	1.2M bytes	NA	X.25	Supports 64 virtual circuits	Transparent	Transparent	OSI[6] 1 to 3	64K	Transparent	Dynamic	$10,950
Applitek Corp. (617) 246-4500	SNA Gateway	Baseband, broadband fiber optic to asynchronous terminals	3278, 3274, 3279	No	NA	NA	SNA[7] LU1, 2, 3	32	32	32	Not available	Up to 56K	Yes	Dynamic	$17,000
	X.25 Gateway	LAN to WAN	CCITT X.28, X.29, X.25, Telnet certified	NA	NA	NA	X.25, HDLC[8] LAP-V	64K or 256K depending on configuration	64	64	OSI 1 to 3	65K	Yes	Both	$17,000
AST Research (714) 863-1480	AST-5250/Gateway	Any IBM Netbios-compatible LAN	5251 Model 11, 5291 Model 1, 5251 Model 12	No	128K	128K	Twinaxial, SNA/SDLC	21	21	15	NA	1M byte (local), 9.6K (remote)	Yes	Both	$1,995
Attachmate Corp. (206) 644-4010	3270 Gateway Option	Netbios-compatible LAN to a mainframe	3270 Models 2, 3, 4, 5, 3170/4	Yes	200K	150K	SDLC[9]	128	128	32 maximum	SNA 1 to 7	19.2K	Not Available	Both	$475 (software only)
Banyan Systems, Inc. (617) 898-1000	VINES SNA	IBM Token-Ring, Arcnet, Corvus Omninet, Pronet, Ethernet, Net/One, Vistalan, Starlan	3274 Model 1C, 3287 Model 2, 3279 Model 2A, 3287 Models 1, 2	No	NA	NA	HDLC	96	96	48	NA	19.2K	Yes	Both	$5,990
	VINES 3270 BSC	IBM Token-Ring, Arcnet, Corvus Omninet, Pronet, Ethernet, Net/One, Vistalan, Starlan	NA	No	NA	NA	3270 bisynchronous	64	64	32	NA	19.2K	Yes	Both	$5,490
	VINES Asynchronous Terminal Servers	IBM Token-Ring, Arcnet, Corvus Omninet, Pronet, Ethernet, Net/One, Vistalan, Starlan	VT100, TTY, VT52, IBM 3101 ANSI	No	NA	NA	Asynchronous	20	20	NA	NA	9.6K	Yes	Both	$1,295
Bridge Communications, Inc. (415) 969-4400	GS/1-X.25	Access to Ethernet host, Ethernet terminal access to PDN[10] host, Ethernet terminal access to X.25 host, PDN host to X.25 Ethernet host communications, X.25 host to X.25 host over Ethernet, Ethernet to Ethernet over X.25 PDN	None	No	NA	NA	XNS, CCITT X.25, X.3, X.28, X.29	48	48	48	NA	64K	Yes	Dynamic	$10,500
Cleo Software Co. (800) 233-CLEO, in Illinois (815) 397-8110	PC-LAN 3270 BSC	Netbios	3271, 3274, 3279 BSC Model 2 with attached 3278 or 3279 Models 2-4 terminal emulation	No	120	90	Bisynchronous	32	32	31	NA	19.2K	Yes	Static	$1,895
	PC-LAN 3270 SNA	Netbios	3274 Model 51C with attached 3279 or 3279 Model 2 terminal emulation	No	256	256	SDLC	32	32	31	NA	9.6K	Yes	Both	$1,995

[1]All points addressable [2]Random-access memory [3]Local-area network [4]Wide-area network [5]Transmission Control Protocol/Internet Protocol [6]Open Systems Interconnect [7]Systems Network Architecture [8]High-level data link control [9]Synchronous data link control [10]Public data network [11]Advanced Program-to-Program Communications [12]Distributed Office Support System [13]Distributed file transfer [14]Remote job entry [15]Houston Automatic Spooling Program [16]Systems Network Architecture Distribution System [17]Binary synchronous communications [18]Control unit terminal [19]Manufacturing Automation Protocol [20]Extended Binary-Coded Decimal Interchange Code [21]Link access procedure [22]Bit-oriented link access procedure

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. Further product information is available from the vendors.

COMPANY	PRODUCT	LINKAGES SUPPORTED	EMULATION PROVIDED	SUPPORTS MAINFRAME APA[1] GRAPHICS	RAM[2] REQUIRED BY GATEWAY	RAM REQUIRED BY EMULATION	LINE PROTOCOLS	MAXIMUM NUMBER OF SIMULTANEOUS SESSIONS	NUMBER OF DISPLAY SESSIONS	NUMBER OF PRINTER SESSIONS	SUPPORTS WHAT LAYER OF OSI/SNA	LINE SPEED (BIT/SEC.)	PERMITS MULTIPLE GATEWAYS ON A NETWORK	STATIC/DYNAMIC ALLOCATION OF SESSIONS	PRICE
Codex Corp. (617) 364-2000	Codex 4255 SNA Gateway	Non-SNA (asynchronous 2780, 3780; bisynchronous 3270) to SNA	3274 Model 51C	No	512K	NA	SDLC; asynchronous 2780/3780; bisynchronous 3271, 3275	40	16	Varies	SNA 1 to 7	19.2 (host speed), 9.6 (device speed)	Yes	Both	$4,600-$12,000
Communications Solutions, Inc. (408) 559-1116	Access/SNA APPC[13]	Netbios LAN to IBM SNA network	LU6.2, PU2.1	No	256K	64K	SNA, SDLC, X.25	32	32	32	SNA 1-7	19.2K	Yes	Both	$1,700 (for 32 sessions)
	Access/SNA 3270	Any workstation to IBM mainframe	LU.1, 2, 3, PU2.0, 3274, 3278, 3279, 3287, 3270	No	256K	192K	SNA, SDLC, X 25	32	32	32	SNA 1-7	19.2K	Yes	both	$1,050 (for 32 sessions)
	Access/DIA	Any workstation to IBM Dasoa or personal services	Document interchange architecture emulation, LU6.2	No	256K	192K	SNA, SDLC, X.25	32	32	32	SNA 1-7	19.2K	Yes	Both	$2,625 (for 32 sessions)
Corvus Systems, Inc. (408) 281-4100	Omninpan X.25 Gateway	Corvus Omninet to X.25 network	TTY, VT100	No	16K	120K	HDLC	32 or 256	32 or 256	None	OSI 3	64K	Yes	Dynamic	$2,115-$3,279
	Omninpan SNA/3270 Gateway	Corvus Omninet to IBM 370	3278/79 Model 2, 3287, 3279-S3G	Yes	16K	140K	SDLC	32 or 256	32 or 256	32 or 256	SNA 1-7	64K	Yes	Dynamic	$2,369-$3,510
	Omninpan QLLC Gateway	Corvus Omninet to IBM 370 via X.25 network	3278/79 Model 2, 3287, 3279 Model S3G, TTY, VT100	Yes	16K	180K	HDLC	32 or 256	32 or 256	32 or 256	SNA 7, OSI 3	64K	Yes	Dynamic	$2,796-$3,999
	NSC DQE Network Interface	Corvus Omninet to VAX Q-bus	VT 220, Teletronix 4010	No	8K	130K	NA	8	8	8	OSI 3	1M byte	Yes	Dynamic	$2,495
	NSC DUX Network Interface	Corvus Omninet to VAX Unibus	VT220, Teletronix 4016	No	8K	130K	NA	24	24	24	OSI 3	1M byte	Yes	Dynamic	$5,495
Data Interface Systems Corp. (800) 351-4244	DI 3270	Novell Network to IBM running VM or MVS	3274, 3174, 3278 Models 2, 5, 3287	No	256K	170K	SDLC, bisynchronous	254	4 per work-station	254	NA	19.2K	Yes	Both	$1,995-$4,895
Datapoint Corp. (512) 699-4437	Vista Gate	Arcnet	3278 Model 2, 3287 Model 2, 3777 Model 1, 3279 Model 2B	No	640K	512K	SDLC, IBM Qualified Logical Link Control (X.25, IBM), X.25 1984	16	16	16	SNA 1 to 7, OSI 1 to 3	64K	Yes	Both	$750-$1,000 (for gateway)
Develcon Electronics, Inc. (415) 829-6200	7183 802.3 Gateway Card	TCP/IP to any host or LAN supporting TCP/IP	NA	Yes	256K	NA	TCP/IP	64	8	8	NA	10	Yes	Static	$9,150
Digital Communications Associates, Inc. (404) 442-4000	Irmaha SDLC Gateway	Netbios to IBM mainframe	3278/9 Model 2, 3, 4, 5, 3179 Model G	Yes	256K	150K-256K	SNA/SDLC	32	32	32	OSI 1 to 5	19.2K	Yes	Both	$1,195
	Irmaha DFT[10] Gateway	Netbios to IBM mainframe	3278/9 Model 2, 2, 4, 5, 3179 Model G	Yes	256K	150K-256K	SNA/SDLC	5	5	5	OSI 1 to 5	NA	Yes	Both	$1,100
Digital Equipment Corp. Contact your local DEC sales office	Decnet/SNA	Decnet to SNA networks	All models of 3270 emulation	No	2M bytes	NA	SDLC	32	32	32	NA	56K	Yes	Both	Starts at $16,000
Fox Research, Inc. (513) 433-2338	10 Gate 3270 Gateway	Ethernet (proprietary 10-Net) to IBM 3030, 3080, 3090, 4300 or 370	IBM 3274, 3278, 3279	No	384K	100K	SNA, bisynchronous	32	32	31	NA	19.2K	Yes	NA	$1,995
Gandalf Technologies, Inc. (312) 459-6630	Starmaster	802 3 Ethernet Version 11, 24, 35	3274 Model 51C, 3276 Model 12, 3278 Models 1 to 5, 3178, 3179	Yes	8K	NA	Circuit switch to packet switch, baseband (CSMA/DC), SNA/SDLC to ASCII Asynchronous, BSC to ASCII Asynchronous	2 (ASCII), 16 (SNA)	2 (ASCII), 4 (SNA)	2	OSI 1-5	64K-512K	Yes	Dynamic	$150-$275
Gateway Communications, Inc. (714) 553-1555	G/SNA Net	G/Net, G/Ethernet, G/Token Ring or other Advanced Netware-based LAN (2.0A or greater)	LU type 2 3279 console, 3274 Model 51C, 3278 Model 79, 3770 RJE	No	64K	256K	SDLC	32	NA	NA	NA	19.2K	Yes	Dynamic	$2,530
	G/Asynchronous Gateway	G/Net, G/Ethernet, G/Token Ring or any Advanced Netware based LAN (2.0A or greater)	DEC VT52, VT100, IBM 3101, Lear Siegler ADM-3A, Hazeltine 1500, Televideo 912, ADDS Viewpoint	No	256K	256K	NA	16	NA	NA	NA	19.2K	Yes	Dynamic	$1,440
	G/X.25 Gateway and Bridge	G/Net, G/Ethernet, G/Token Ring, or other Advanced Netware-based LAN (2.0A or greater)	VT100, ANSI TTY	No	64K	256K	NA	32-64	NA	NA	NA	19.2K	Yes	Dynamic	$2,495

COMPANY	PRODUCT	LINKAGES SUPPORTED	EMULATION PROVIDED	SUPPORTS MAINFRAME APA[1] GRAPHICS	RAM[2] REQUIRED BY GATEWAY	RAM REQUIRED BY EMULATION	LINE PROTOCOLS	MAXIMUM NUMBER OF SIMULTANEOUS SESSIONS	NUMBER OF DISPLAY SESSIONS	NUMBER OF PRINTER SESSIONS	SUPPORTS WHAT LAYER OF OSI/SNA	LINE SPEED (BIT/SEC.)	PERMITS MULTIPLE GATEWAYS ON A NETWORK	STATIC/DYNAMIC ALLOCATION OF SESSIONS	PRICE
Harris Corp. (800) 4-HARRIS	Harris 9300 Network Communications System	Harrinet, IBM Token-Ring network	3278 Models 2, 2, 4, 3279, RJE[3]-SNA, 3780, HASP[3] multileaving	No	NA	64K	SNA/SDLC, LU.1, 2, 2, 6.2, SNADS[3], BSC[3], Communications Research Group's BLAST, asynchronous	128 per host	128 per host	127	SNA 1 to 7	2K-56K	Yes	Both	From $7,595
Hewlett-Packard Co. (408) 447-2180	SNA Server	802 3 to SDLC/SNA	3287, 3274, 3276, 8180 DPPX/RJE, 3770	No	4M bytes	2M bytes	SDLC/SNA	64 or 8	1	Varies	SNA 1 to 7	56K	Yes	Dynamic	$2,850-$11,000
	HP-UX Gateway/SNA Link	802.3 Ethernet to SDLC/SNA	3274 Model 61C, 3287 Model 2, 3777Model 1	No	455K	120K	SDLA/SNA	50	50	Varies	SNA 1to 7	64K	Yes	Dynamic	$1,020-$10,000
Mosaicsistem, Inc. (800) 257-6027	Mosaicomm 5251 Gateway	IBM Token-Ring to IBM System/34, 36, 38	5250, 5292 Model 1, 2, 5291, 5251 Model 11, 3180, 5219, 5224, 5225, 5256	Yes	128K	128K	Twinaxial	31	7	8	NA	1M	Yes	Both	$1,495
	Mosaicomm 5250 Remote Gateway	IBM Token-Ring to IBM System 3X	5250, 5292 Model 1, 2, 5291, 5251 Model 11, 3180, 5219, 5224, 5225, 5256, 5251-12, 5294	No	128K	128K	SNA/SDLC	36	9	8	NA	19.2K	Yes	Both	$1,775
Information Technologies, Inc. (602) 998-1033	Link-Up M/Channel 3270 Gateway	Netbios interface to any IBM LAN with Netware, 3Com 3+ Share	3274 Model 51C, 3274 Model 31C, 3278 Model 2, 3279 Model 2, 3287, 3289, 3279, 3174, 3179	Yes	386K	21K	Busynchronous, SNA/SDLC	32 per gateway	32 per gateway	32 per gateway	OSI and SNA 1 to 7	19.2K	Yes	Static	$4,495 (for 32 sessions)
	Linkup M/Channel Coax Gateway	Netbios interface to any LAN	3278/79 Model 2, 3287, 3289	Yes	250K	80K	IBM 3270 Coaxial CUT[3] or DFT mode	5 (40 with 3299 option)	5 (40 with 3299 option)	5 (40 with 3299 option)	OSI and SNA 1 to 7	2.35M	Yes	Determined by control unit	$1,495
	Linkup 3270 Gateway/Fox 10-Net	DCA/Fox 10-Net LAN	3274 Model 51C, 3274 Model 31C, 3278 Model 2, 3279 Model 2, 3287, 3289, 3276, 3174, 3179	Yes	386K	21K	SNA/SDLC, busynchronous	32 per gateway	32 per gateway	32 per gateway	OSI and SNA 1 to 7	19.2K	No	Static	$2,995 for 32 sessions
	Linkup Coaxial Gateway	Netbios interface to any LAN	3278/79 Model 2, 3287, 3289	Yes	250K	80K	IBM 3270 Coaxial CUT or DFT mode	5 (40 with 3299 option)	5 (40 with 3299 option)	5 (40 with 3299 option)	OSI and SNA 1 to 7	2.35M	Yes	Determined by control unit	$1,495 (5 sessions)
	Linkup 3270 Gateway	Netbios interface to any IBM LAN with Netware, 3Com 3+ Share	3274 Model 51C, 3274 Model 31C, 3278 Model 2, 3279 Model 2, 3287, 3289, 3276, 3174, 3179	Yes	386K	21K	SNA/SDLC, busynchronous	32 per gateway	32 per gateway	32 per gateway	OSI and SNA 1 to 7	19.2K	Yes	Static	$2,995 (32 sessions)
INS Corp. (800) 762-3270	SDLC Gateway Adapter	Netbios LAN with compliant host mainframe	3274 Model 51C controller emulation giving 3287 LU.1,3 printer support, 3278, 3279 Model 2, 3	No	128K-256K	60K	SNA, SDLC	32	2 per workstation	1 per workstation	NA	19.2K	Yes	Both	$1,995-$3,995
	X.25 Gateway Adapter	Netbios-compatible LAN to X.25 permanent/ virtual circuits to SNA host	3274 Model 51C controller emulation giving 3287 LU.1, 3 printer support, 3278, 3279 Model 2, 3	No	128K-256K	60K	X.25	32	2 per workstation	1 per workstation	OSI 3	19.2K	Yes	Both	$1,995-$3,995
	8100 Gateway Adapter	Netbios-compliant LAN to IBM 8100 communications loop	3274 Model 51C controller emulation for 3287 LU.1, 3 printer support, 3278, 3279 Model 2, 3	No	128K-256K	60K	SNA, SDLC	32	2 per workstation	1 per workstation	NA	96K, 38.4K	Yes	Both	$3,595-$5,595
Intelligent Technologies International Corp. (415) 345-6666	Gateway Exchange	Netbios-compatible network to IBM SNA	3274, 3174, 3278, 3279, 3180	No	128k	64K per workstation	SDLC/ busynchronous	64	64	1 per workstation	SNA 1 to 7	19.2K	Yes	Dynamic	$1,995 (for PC), $2,495 (for PS/2)
Interlink Computer Sciences, Inc. (415) 657-9800	37XX Gateway	IBM 370 architecture to Decnet	VT100, 3278 Model 2	No	512K-5M bytes	512K-5M bytes	Ethernet, synchronous, asynchronous	128	128	128	NA	800K	Yes	Dynamic	$45,000-$150,000
Micom-Interlan, Inc. (617) 263-9929	Netware TCP Gateway	Netware TCP Networks to all Netware subnets (Arcnet, Ethernet, IBM Token-Ring)	VT220, VT100, VT102, VT52	Yes	80K (for workstation), 100K (for server)	60K	IPX, TCP/IP	31	31	1 per workstation	OSI 1 to 7	10M	Yes	Dynamic	$3,995 per server

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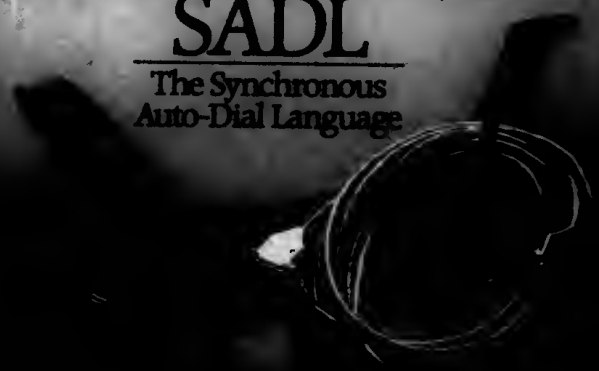
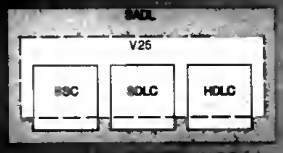
Modcomp, an AEG company (305) 974-1380	Series 300 Network Processor	Asynchronous, synchronous, multi-protocol (SNA, X.25)	—	NA	NA	NA	SDLC, HDLC, X.25, asynchronous	144	1,000	1,000	OSI, SNA 1 to 3	1200-72K	Yes	Dynamic	$7,500-$30,000
Nestar Systems, Inc. (415) 969-1777	X.25 Communications Server	Nethos LAN to X.25 networks	NA	NA	256K	256K	X.25	32	NA	NA	NA	50K	Yes	both	NA
	SNA	Between SNA mainframes with 3274	3274, 3279, 3279	No	256K	256K	SDLC	19	16	19	NA	9.6K	Yes	Both	$5,995
	Asynchronous Communications Server	All asynchronous communications to 19.2K	HP 2600 Series, VT 100, 220	No	256K	256K	NA	19	NA	NA	NA	19.2K	Yes	Dynamic	$5,995
Netlink, Inc. (913) 578-6612	SNA Gate	SNA to asynchronous, bsynchronous	3274	Yes	1M byte standard	NA	LU.0, 1, 2, 3	255	255	255	OSI 1 to 9	19.2K	Yes	Both	$3,900-$9,000
Novell, Inc. (801) 379-5900	TCP/IP Gateway	Any LAN supported by Novell to TCP/IP network or backbone	VT200; 40 other termanal-emulation packages supported	No	Transparent	40K	Xerox Network System, TCP/IP	16	19	19	OSI 1 to 7	Dependent on-line topology	Yes	Dynamic	$3,995
Novell, Inc. Communications Division (800) 225-7300	PC-OX/6W-3270 software and PC-OX/Coaxial interface board	Nethios, SPX	3274, 3278 Model 25, 3179G, 3287	Yes	200K	150K-300K	SNA/SDLC	9	9	4	SNA 1 to 7	2.3M	Yes	Both	$550 (PC-OX/6W-3270), $545 (PC-OX/Coaxial)
	PC-OX/6W-5250 software and PC-OX/Remote interface board	Nethios	5251 Model 11, 12, 5291, 5292, 5294, 5224, 5225, 5256	No	NA	NA	SDLC	9	3	4	SNA 1 to 7	19.2K	Yes	Both	$650 (PC-OX/6W-5250), $395 (PC-OX/Remote)
	PC-OX/6W-3270 software and PC-OX/Remote interface board	Nethios, SPX	3274, 3278 Models 2-5, 3179G, 3287	Yes	200K	150K-300K	SNA/SDLC	19	5	9	SNA 1 to 7	19.2K	Yes	Both	$650 (PC-OX/6W-3270), $395 (PC-OX/Remote)
	PC-OX/6W-3270 software and PC-OX/Coaxial multiplexer interface card	Nethios, SPC	3274, 3278 Models 2-5, 3179G, 3287	Yes	120K	150K-300K	SNA/SDLC	40	3	4	SNA 1 to 7	2.3M	Yes	Both	$850 (PC-OX/6W-3270), $1100 (PC-OX/Coaxial multiplexer)
	PC-OX/6W-3270 software and PC-OX/Remote-Async interface card	Nethios, SPX	3274, 3278 Models 2-5, 3179G, 3287	Yes	120K	150K-300K	SNA/SDLC	64	3	9	SNA 1 to 7	56K	Yes	Both	$850 (PC-OX/6W-3270), $1,400 (PC-OX/Remote)
Orion Network Systems, Inc. (415) 649-4008	3270 Facility	Any Nethios LAN	3274 Model 51C, 3279 Model 2, 3279 Model 2A, 3287 Model 2	No	364K	80K	SDLC, X.25/QLLC	254	254	254	SNA 1 to 6	64K	Yes	Both	NA
	SNA-62 Facility	Any Nethios LAN	IBM APPC	No	414K	30K	SDLC, X.25/QLLC	129032	NA	NA	—	64K	Yes	Both	NA
	X.25 Facility	Any Nethios LAN	NA	No	100K	30K	X.25/HDLC	4096	NA	NA	—	64K	Yes	Both	NA
	3770 Facility	Any Nethios LAN	3776-3	No	364K	80K	SDLC, X.25/QLLC	254	254	254	SNA 1 to 6	64K	Yes	Both	NA
Pathway Design, Inc. (617) 251-7722	Comgate	Nethios LAN to IBM cluster control unit	3278, 3179, 3279	No	150K	200K	SDLC	40	40	40	SNA 1 to 7	56K	Yes	Both	$1,595-$3,595
	Netpath SNA 3270	Nethios LAN to RS 232	3278/9, 3274, 3174, 3174/9	No	150K	200K	SDLC	128	128	32	SNA 1 to 7	56K	Yes	Both	$3,595-$6,995
Proteon, Inc. (617) 898-2800	P4200 Gateway	IEEE 802.5 Ethernet Version 1, 2 and 802.3, Pro-Net-10, 80, T1	None	NA	5M-1M	NA	TCP/IP, Decnet, XNS	Unlimited	NA	NA	OSI level 3	Up to 80M	Yes	Both	Starts at $8,000
Quadram Corp. (404) 564-8585	Minilink 3278 Gateway	Any advanced network (Prime, 3Com Ascent)	3278 Model 2, 3287	No	NA	128K	SDLC	32	32	32	OSI 9 to 7	Up to 56K	Yes	Dynamic	$3,595-$6,295
Rabbit Software Corp. (800) RABBITC	Rabbitgate	Nethios LAN to IBM mainframes	3770, 3274, 3276, 3174 control units, 3278, 3279 Models 2, 3, 4, 5	Yes	150K	30K	SNA/SDLC, X.25, bsynchronous	32 per board (256 per LAN)	32 per board (256 per LAN)	32 per board (256 per LAN)	SNA 1 to 7	56K	Yes	Both	$1,995 and up
Software Results Corp. (314) 207-2308	Combaard with Send Plus	Decnet to IBM mainframes	SNA, HASP and 3780	No	NA	NA	SNA, HASP, 3780	30	30	NA	SNA 1 to 7	56K	Yes	Both	$4,500-$16,500

Auto-Dialing In The New Frontier

SADL

The Synchronous Auto-Dial Language





V.25 *bis*
So we
which is
V.25 *bis*, but
synchronous
SDLC and
the standard
bps.
it for
is long
on IBM
mid-

of all
Network
Automated
cross-network dial-
call reconnec-
modem pools on LANs
And unattended off-hours dialing for collection of PC files or point-of-sale data.

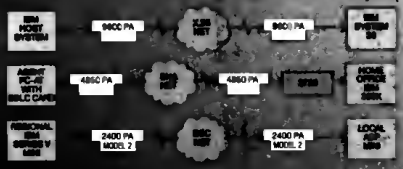
Riding High In The Fortune 500

SADL has already been pioneered by some pretty impressive customers. And with pretty impressive results.

A major American automotive company now exchanges credit information between System/36 computers at their dealerships and headquarters, using SADL-equipped modems and an X.25 packet switching network.

Branch agents at a large insurance company can now directly access the home office's IBM 308X mainframe data base with their PCs, using SADL modems over an SNA/SDLC network.

And at a Canadian parts and inventory operation, SADL-equipped modems eliminated the need for $218,000-worth of RS-366 ports and 801 ACUs on a 400-line BSC dial-up network.



back almost two decades, today's Racal-Vadic breed includes the finest line of synchronous remote dial-up modems ever developed.

At 2400 bps, there's the V.22 *bis*-compatible 2400 PA Model 2. At 4800 bps, the 208B and V.27 *ter*-compatible 4850 PA, which can also be upgraded to 9600 bps. And at 9600 bps, the V.29 and V.27 *ter*-compatible 9650 PA.

At the central site the 208A/B and V.27 *ter*-compatible VA4891 runs at up to 4800 bps, and the V.29 VA9691 at up to 9600 bps.

More importantly, these are *networking* modems, perfectly suited for centrally-managed dial-up networks.

Riding Herd With A Dial-Up Network Management System

MDS-II is the world's first network management system for dial-up modem networks.

With MDS-II, you can build a network with dozens or even hundreds of modem chassis. You can mix sync and async modems. And thanks to SADL, different dialing protocols, too.

Each MDS-II chassis has space for up to 16 VA4891 and VA9691 modems. Each of these

And MDS-II does all this, and more, with an open architecture that won't sacrifice performance today or opportunity tomorrow.

The Race To A New Auto-Dialing Standard

A lot of dial-up sync frontiers have already been settled. SADL software drivers have been

Corp.; Network Software On-Line Software International; Pathway Design, Inc.; The Software Group; and Winterhalter, Inc.

And SADL networks are already up and running for a large number of blue chip end users, including Ford Motor Company, Shell Oil, Ralston Purina, General Motors, ADP Dealer and Employer Services, Pizza Hut, Federal Reserve Bank, Tektronix, and GTE Telecom.

Hitch Up For A Free Ride.

The SADL Implementation Program

Whether you're a communications programmer in a Fortune 1000 corporation, a third party developer of synchronous emulation products, or anybody else with synchronous dial-up needs, it's easy to jump on the SADL bandwagon.

Because we'll give you a free ride.

In fact, we'll give you everything you need to implement SADL anywhere you like.

Starting with a free Designer's Guide, to help you integrate SADL into your synchronous networks and products.

Then, so you can test your products in the real world, we'll loan you six SADL-compatible Racal-Vadic modems for up to 60 days.

And when you purchase, special price discounts on those same modems.

Finally, we'll back you up with Complete Technical Support, including a full time, toll-free hot line.

So SADL up today

Call **800-482-3427** and ask for your free Designer's Guide. Then get on the trail to full SADL implementation.

You may round up a lot more than savings.

RACAL

Racal-Vadic

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Tel: (408) 432-8008 • TWX: 866-403 RAVA MLP

COMPANY	PRODUCT	LINKAGES SUPPORTED	EMULATION PROVIDED	SUPPORTS MAINFRAME APA[1] GRAPHICS	RAM[2] REQUIRED BY GATEWAY	RAM REQUIRED BY EMULATION	LINE PROTOCOLS	MAXIMUM NUMBER OF SIMULTANEOUS SESSIONS	NUMBER OF DISPLAY SESSIONS	NUMBER OF PRINTER SESSIONS	SUPPORTS WHAT LAYER OF OSI/SNA	LINE SPEED (BIT/SEC.)	PERMITS MULTIPLE GATEWAYS ON A NETWORK	STATIC/DYNAMIC ALLOCATION OF SESSIONS	PRICE
TDT Group, Inc. (305) 372-9332	Six/25	Nethios LANs	3274, 3278, 3279, 3287, 3289	No	42K	216K	X.25/SNA	32	6 (per workstation)	1 (per workstation)	OSI 1 to 7	19.2K	Yes	Static	$1599 (for gateway), $349 (for workstation)
	Honeybunch Gateway	All Nethios LANs	7700, 7760, 7804, 7814	Yes	121K	99K	Synchronous, X.25/Distributed Systems Architecture	32	2 (per workstation)	1 (per workstation)	OSI 1 to 7	19.2K	Yes	Dynamic	$499 (for gateway), $299 (for workstation)
Techland Bluelynx, a division of Micro-Integration, Inc. (212) 684-7788	Bluelynx 5250 GCP	Nethios LAN to IBM System/34, 36, 38	5251, 5291, 5292, 3180, 5224, 5225, 5256, 5219	No	70K	70K	SNA/SDLC	9	9	9	NA	9.6K	Yes	Both	$1,995
Tokay Automation, Inc. (617) 275-3875	MAP[3]/X.25	MAP (IEEE 802.4) to X.25 WAN	NA	No	16M	NA	OSI	32	NA	NA	OSI 1 to 7	64K	Yes	Both	$21,000
Tridata Corp. (415) 969-3700	Netway 1000A	Appletalk to SNA	3278	No	NA	100K	SNA, bisynchronous	16	16	2	SNA 1 to 7	19.2K	Yes	Both	$3,195
	Netway 1500	Arcnet, Ethernet 802.3 to mainframes	3278, 3274	No	NA	512K	SNA 3270, Bisynchronous, EBCDIC[4], ASCII	4	2	Up to 4	SNA PU-type 2, LU.1, 2, 3	300-64K	NA	Both	$1,000 per user
Ungermann-Bass, Inc. (408) 496-0111	Net/One NTV-74	Net/One 802.3 to 802.5 to IBM 3274 or 3174	IBM 3270, 3278 Models 2-5, 3270, 3278	Yes	NA	NA	3270, DFT (SNA)	16	16	16	OSI 1 to 7	2.3M	Yes	Both	$4,835
	Net/One X.25 Gateway	Ungermann-Bass Net/Om 802.3 to X.25 packet-switching network	NA	NA	NA	NA	LAP[5], LAPB[6]	32	32	32	OSI 1 to 3	500K	Yes	Both	NA
Wall Data, Inc. (206) 883-4777	Datagate/LAN 3270	Nethios LAN to IBM 3270	3278, 3279 Models 2, 3, 4, 5	No	80K bytes	180K bytes	SNA, bisynchronous	128	7	7	SNA 1 to 6	19.2K	Yes	Both	$1,995-$3,495
	Datagate/LAN 5250	Nethios LAN to IBM 5250	5251 Model 1, 5291, 5292, 5256	No	80K bytes	200K bytes	SNA/SDLC	32	7	7	SNA 1 to 6	19.2K	Yes	Both	$1,995-$3,495
Waterloo Microsystems (519) 884-3141	Port 3270 Server	Port LAN to IBM mainframe	3278	No	Configuration-dependent	Configuration-dependent	Coaxial	1	1	NA	OSI 1 to 6	NA	Yes	Dynamic	$1,195
	Port Asynchronous Internet Gateway	Arcnet, IBM Token-Ring or broadband to Arcnet	TTY terminals, VT100	NA	Configuration-dependent	Configuration-dependent	Asynchronous	32	11	32	OSI 1 to 6	19.2K	Yes	Dynamic	$1,495
	Port X.25 Server	Arcnet, IBM Token-Ring or broadband LAN to hosts on another Arcnet; IBM Token-Ring or broadband LAN running Port via X.25 packet-switched network	TTY terminals, VT100	NA	Configuration dependent	Configuration dependent	X.25, asynchronous	32	NA	NA	OSI 1 to 6	64K	Yes	Dynamic	$2,995
	Port Backbone Internet Gateway	Connects Arcnet, IBM Token-Ring or broadband LAN to another Arcnet, IBM Token-Ring or broadband LAN running Port via backbone LAN	NA	NA	Configuration-dependent	Configuration-dependent	NA	255	NA	NA	OSI 1 to 6	Protocol-dependent	Yes	Dynamic	$1,995-$2,995
	SNA Server	Port LAN to IBM mainframe via SNA/SDLC link	3278/79	No	Configuration-dependent	Configuration-dependent	SNA/SDLC	32	31	NA	OSI 1 to 6	19.2K	Yes	Both	$3,195-$5,500
Westinghouse Management Systems Software (800) 348-3523	ITEX.25	X.25 network to IBM mainframes	TTY terminals, VT100	No	NA	NA	X.25	Unlimited	Unlimited	1	NA	9.6K	Yes	Dynamic	$19,500
Xerox Network Systems (213) 333-2300	XNS Gateway Access Protocol	Ethernet to mainframe environments (IBM, DEC) supporting the following emulation	3270, 3780, 2780, VT100, TTY terminals, IBM PC compatibles	Yes	Varies	Varies	All ISO/OSI Level 1 protocols	Varies	Varies	—	OSI	10M	Yes	Both	$300-$15,000
Xyplex, Inc. (617) 371-1400	Xyplex Ethernet Gateway	Ethernet 802.3 to T1	VAX terminal to host protocols	No	64K	64K	VAX terminal to host protocols	64	NA	NA	OSI 1 to 3	64K-250K	Yes	Dynamic	$4,900 per end

"I called three times and got cut off three times. Then I thought, what if I'd been a customer? Would I have bothered?

My plane was late so I wanted to let the office know. Well, I'm trying to call but nobody's picking up. I start counting the rings and I'm up to 12 when, finally, somebody picks up and mumbles "lobby." Then click, I'm disconnected. Three times in a row this happens. And I'm just about to boil. I'm thinking, what's happening to other callers? How many sales are falling through the cracks? Why did we ever gamble with this cursed phone system when we knew

AT&T comes through."

AT&T Messaging Solutions

With an AT&T System 85 or 75, you can permanently remove communications barriers between your people and your customers. Reason: AT&T's *Unified Messaging* products provide the widest range of integrated messaging options in the industry, so virtually no calls will go unanswered.

Example: *Audio Information Exchange* or *AUDIX* lets users send or retrieve *spoken* messages around the clock, through a company-wide message-recording system.

Example: Through a *Message Center*, your trained staff can intercept unanswered calls. And provide up-to-the-minute information on your people, wherever they are.

To learn more, contact your AT&T Account Executive. Or call 1 800 247-1212.

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The right choice.

Computerworld First with the news that's important to you.

Computerworld:

SQL to get short shrift in Dbase IV

Update expected to offer language subset, limited access to host data base

BY DOUGLAS BARNEY

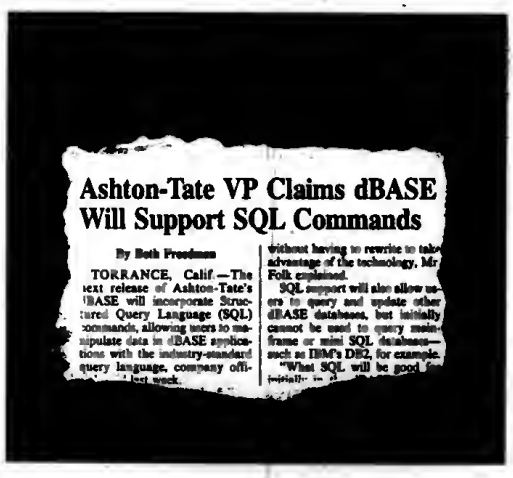
TORRANCE, Calif. — Ashton-Tate will not include a full version of IBM's SQL in its next-generation Dbase package, according to t[illegible] forthcoming

The lack of a full SQL will limit the product's ability to communicate with host data bases.

While a more complete implementation of SQL is expected in Ashton-Tate's future products for Microsoft Corp.'s MS [illegible] the [illegible] Dbase, commonly called D[illegible] IV, will include only a subset [illegible] SQL, these sources said. [illegible] ton-Tate has not formally announced Dbase IV. Company officials were unavailable [illegible] comment last week.

[illegible] Tate previous[illegible]

PC Week:



Ashton-Tate VP Claims dBASE Will Support SQL Commands

By Beth Freedman

TORRANCE, Calif.—The next release of Ashton-Tate's dBASE will incorporate Structured Query Language (SQL) commands, allowing users to manipulate data in dBASE applications with the industry-standard query language, company officials [illegible] last week.

without having to rewrite to take advantage of the technology, Mr. Folk explained.

SQL support will also allow users to query and update other dBASE databases, but initially cannot be used to query mainframe or mini SQL databases—such as IBM's DB2, for example.

"What SQL will be good [illegible]

September 21, 1987

September 29, 1987

Because you can't wait.

COMPUTERWORLD

An IDG Communications Publication

ASK THE VENDOR

The following questions were solicited from users and conveyed to the vendors for responses.

Does NEC plan at any time to announce an ISDN-compatible facsimile machine?

Marshall Weingarden
President
Communications Advisors, Inc.
Southfield, Mich.

NEC AMERICA, INC.: NEC manufactures a terminal adapter that interfaces our facsimile products to Integrated Services Digital Network (ISDN) networks with either NEC or AT&T switches via RS-232, X.21 or V.35. Other manufacturers, such as Northern Telecom, Inc. and Siemens Information Systems, Inc., also provide terminal adapters that can be used to connect our facsimile products to their ISDN switches.

Currently, switch manufacturers offer different implementations of ISDN. Interfacing a device at the basic rate involves different protocols.

As ISDN truly becomes a standard, NEC will then have one protocol at which to aim and will consider building a terminal adapter into the facsimile machine itself. The Group IV series already has the required space available.

However, because of the terminal adapter solution, we have not received many inquiries from customers about doing this, so it is not a priority.

What is Micom planning in terms of an Ethernet interface for the 6000 series data private branch exchange line? Does Micom plan to provide a central management system for integrated control and monitoring of multiplexers and switches at one console?

Craig Leu
Manager of Telecommunications
Columbia Savings and Loan Association
Irvine, Calif.

MICOM SYSTEMS, INC.: Ethernet local-area networks and data PBXs are most typically used for dissimilar applications. While the primary use of Ethernet is for large-block file transfers among work groups of a small size, data PBXs are intended for interactive communications on larger networks.

Micom bridges these two realms by providing the NTS470 interface to Ethernet in its Instanet 6000. This is an eight-channel gateway that supports Ethernet 802.3 running Transmission Control Protocol/Internet Protocol.

Is IBM planning to support the LU6.2 protocol under MVS?

Jeff Edgmond
Manager, Data Communications
Nike, Inc.
Beaverton, Ore.

IBM: This June, IBM announced Version 3 of ACF/VTAM. VTAM Version 3 Release 2 for MVS/XA, MVS/370, VM/SP and VSE provides improved communications capabilities for Systems Network Architecture type 2.1 nodes and a high-level application program interface for the Advanced Program-to-Program Communications-type LU6.2 protocol.

The new release is scheduled to be available in the third quarter of 1988.

For asynchronous dial-up modems, Microcom Network Protocol (MNP) error correction seems to be a de facto standard. Will Multi-Tech's support of this standard persist in the future?

Ben Johnson
Manager of Communications and Hardware Support
General Electric Co.
Drive Systems Operations
Salem, Va.

MULTI-TECH SYSTEMS, INC.: MNP Class 3 is by far the most popular firmware-based error-correction protocol used by modem manufacturers. Along with MNP data compression Classes 4 and 5, MNP Class 3 is offered in Multi-Tech's 1,200 and 2.4K bit/sec. asynchronous dial-up modems.

A small number of modem manufacturers that have not offered error correction in the past are now proposing Link Access Procedure (LAP)-B and LAP-D standards and opposing MNP, but we suspect their reasons may be based more on an unwillingness to conform to a competitor's technology than on valid technical and industry concerns.

CCITT is presently evaluating both MNP and LAP and will likely recommend a modified LAP standard that includes MNP Classes 3 and 4. Multi-Tech's plans are to continue offering MNP Classes 3, 4 and 6 (9.6K bit/sec. transmission) in its line of Multimodems and address the LAP protocols if and when they become a factor in the marketplace.

When will the 10M bit/sec. version of AT&T's Starlan be available, and will the new release run on the current cabling configuration? Is AT&T planning to provide users with a private branch exchange alternative to the Models 75 and 85 in the near future?

Carlos Alvarado
Manager of Systems and Data Communications
Chase Federal Savings and Loan
Miami

AT&T: AT&T is working on a 10M bit/sec. local-area network that will use unshielded twisted-pair wiring and be compatible with today's Starlan Network product line. It will be available in mid-1988.

The System 75 and System 85 will continue to be AT&T's flagship PBXs for intermediate and large business customers.

In keeping with this strategy, AT&T announced the following three enhancements this year:

- The System 75 XE. A modular design allows users to start with a smaller, cheaper System 75 and grow from 40 to 100 stations with a single module. The System 75 XE can expand up to 600 stations without a hardware upgrade.
- The System 85 Advanced Networking Switch, the first private branch exchange on the market to implement the ISDN Primary Rate Interface.
- The System 85 SE, which includes a back-up processor for increased reliability.

AT&T has planned future enhancements as well.

What are Spectrum Concepts' plans for providing technical support, quality control and documentation for Xcom 6.2, given an increasing customer base, increasing competition and an increasing number of computers on which Xcom 6.2 runs?

Tom Smith
Manager of Data Communications
Reynolds Metals Co.
Richmond, Va.

SPECTRUM CONCEPTS, INC.: Since Spectrum Concepts has based Xcom 6.2 entirely on LU6.2, the implementations of Xcom 6.2 are independent of the operating system so that we do not necessarily have to maintain separate modules for each application.

Thus, although the number of supported computers is growing, the technical complexity remains fairly constant.

Nevertheless, Spectrum Concepts is activating a three-pronged strategy to accommodate the increase in our customer base. We are increasing the size of our customer support staff and instituting cross-training between development teams.

We have recently created an autonomous quality control group, in which individual compensation is linked to the number of bugs discovered. Finally, we have tripled the number of technical writers on the Xcom project. •

VENDOR VIEWPOINT

Guessing games precede OS/2 arrival

BY DEANNA JUAN IPSEN

Through the years, corporate MIS managers have seen personal computers grow from stand-alone units to integrated systems with access to minicomputers and mainframes. Another evolutionary step is now in the making with the advent of Microsoft Corp.'s OS/2.

Connectivity through Microsoft's MS-DOS emulation products provides an essential communications link in countless organizations. These products control hardware and software interrupts and write directly to screen memory in order to obtain maximum performance. They also provide a multitasking kernel on top of MS-DOS to handle asynchronous processes.

When OS/2 arrives, the picture will change. Developers of communications products and MIS managers must consider how connectivity will be provided in the OS/2 environment.

The release version of OS/2, now expected late this year or in early 1988, will offer multitasking functions within the operating system itself. This means that code to support functions such as time slicing and hot-key switching from MS-DOS to emulation will be redundant in the OS/2 environment.

Microsoft maintains that, for the most part, popular application programs written for MS-DOS, such as Lotus Development Corp.'s 1-2-3, will run in the OS/2 MS-DOS compatibility mode. But communications programs — such as emulation and networking that relied on internal MS-DOS functions — will not automatically transfer to OS/2.

For developers, this means at least some measure of software redesign will be required. The extent of such revisions will depend on whether products are created for OS/2's MS-DOS compatibility mode or its protected mode.

Which way to go?

Vendors are already grappling with the question of where to concentrate research and development resources. Continuing development for MS-DOS may prove worthwhile, if a significant share of the MS-DOS installed base remains in place and the demand for communications in corporate MIS departments continues. However, the fact that only 640K bytes of memory can be accessed is a definite limitation.

The other option, developing for OS/2, also presents certain trade-offs. On the plus side, OS/2 will provide greater functionality, including true multitasking, time slicing, dynamic linking and interprocess communications. It will also allow access to a larger address space. In protected mode, the program is prevented from accessing areas outside its allotted memory space.

> THE rationale for designing products for OS/2's MS-DOS compatibility mode hinges on how easily existing emulation programs can be revised.

One major negative factor is that the large installed base of machines that use different and less powerful processors cannot migrate from MS-DOS to OS/2. In addition, OS/2 requires an enormous amount of memory.

In protected mode, users can make full use of the power of OS/2. With various facilities for interprocess communications, the multitasking environment will allow the development of more flexible programs. The dynamic linking feature will provide support for true dynamic reconfiguration for terminal emulation products.

The rationale for designing products for OS/2's MS-DOS compatibility mode hinges on how easily existing emulation programs can be revised. If developers only need to make a few adjustments to an emulation program, the effort would certainly be worthwhile.

If, on the other hand, development for MS-DOS compatibility involves considerable redesign of existing emulation products, then resources may be better devoted to product development for protected mode in the OS/2 environment.

Products for protected mode will likely be more versatile and more powerful as well as more expensive for vendors to develop

Continued on page S32

Ipsen is director of PC communications products for Idesassociates in Billerica, Mass.

3STATION. THE NETSTATION DESIGNED TO IMPROVE THE PERFECT NETWORK.

3Station's tiny footprint (14" x 14" x 3") means more space and less clutter on a user's desk.

Two years ago 3Com introduced the first network optimized server.

Today 3Com introduces the first network optimized workstation.

With 3Station we've significantly increased the performance and productivity of 3System by putting technology to work for you.

3Station is easy to use and offers better performance and reliability than using adapted PCs on your network.

And its high performance 80286 microprocessor and 1Mb main memory

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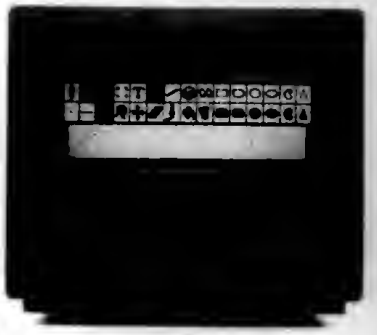
Use 3Com's 101-key, AT-compatible keyboard or any other AT-compatible keyboard.

provide up to 35% more memory for your applications than adapted PCs.

This makes 3Station the optimized workstation for business productivity applications such as database, spreadsheet, business graphics, publishing and word processing.



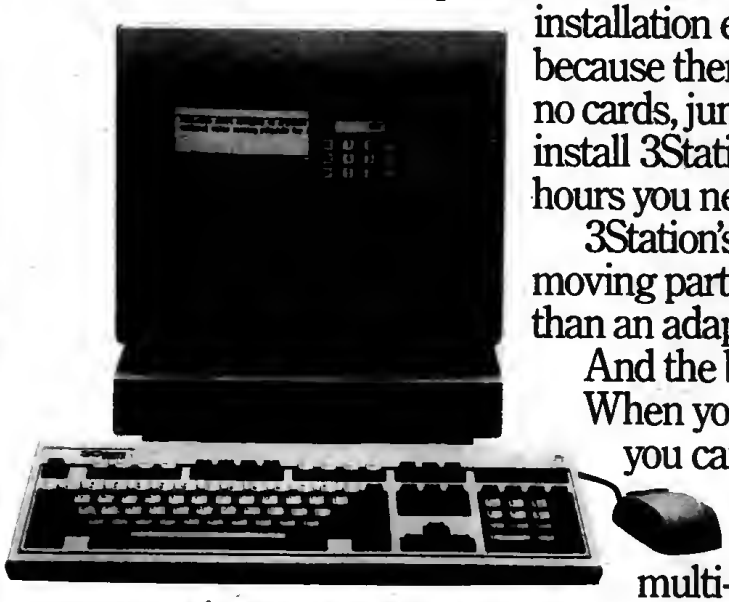
You can use EGA, CGA or monochrome (including Hercules), monitors with 3Station.

3Station's built-in EGA graphics, Ethernet adapter, I/O and memory increase performance and make installation easy because there are no cards, jumpers or switches. You can install 3Station in minutes rather than the hours you need to adapt a PC.

3Station's single board design with no moving parts also provides more reliability than an adapted PC.

And the best news of all?

When you use 3Station in a 3System, you can realize significant cost savings, up to 50% per user, compared to adapted PCs or multi-user micros and minicomputers.



3Station is ideal for memory-intensive applications.

So with 3Station's price and performance, why use adapted PCs on your network?

When the future is 3Station.

For your nearest 3System dealer, or more information, call 1-800-NET-3Com.

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WORKGROUP SYSTEMS

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Muscle

CONTINUED FROM PAGE S19

features include the CRC algorithm for error detection and retransmission; EBCDIC to ASCII, or vice versa; data conversion and compression and file transfer of data, including binary files using eight-bit binary data with no parity; accounting; and security.

Data base elements

The host communications data base contains the same detailed information for each location as the PC-based communications program.

Additional elements defined in the data base include location, time zone and which days of the week to communicate. Communications can be directed to a single selected destination, locations within specific time zones or all locations.

Prevention of unauthorized dial access to information will become a consideration in January, when we move to the second phase of our plan and begin allowing PC-initiated calls to the host from the offices of independent agents.

The way we provided for security is to arrange a two-phase communications arrangement for data exchange. The microcomputer will dial the host automatically, transmit its data and then disconnect. The host will immediately call back the microcomputer in order to transmit the output data to the remote disk.

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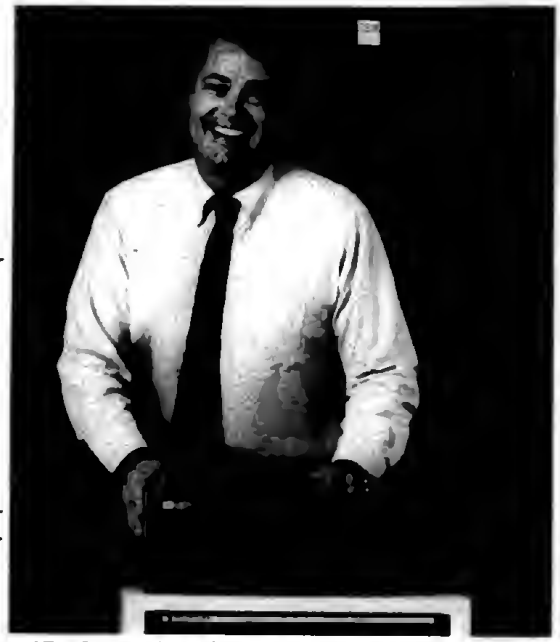

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Games

CONTINUED FROM PAGE S29

and users to purchase. The implications of such a major investment will be carefully analyzed by developers and users from their separate perspectives.

Toward the end of 1988, IBM is expected to begin marketing OS/2 Extended Edition, which will include its own communications manager to support various connectivity options — such as the 3270, asynchronous and local-area networks — concurrently. Users will be able to monitor the performance of their networking through the network management software that will come with the Extended Edition. IBM may also provide an application programming interface capable of evolving into a much-needed industry standard.

Technical documentation for the Extended Edition has not yet been made available, and prospective third-party developers must remain flexible until there is more information about both compatibility issues and the capabilities of the communications manager.

Connecting systems under OS/2 will not be a matter of rote. For vendors, it will probably mean adapting to a new and significantly different connectivity technology. For MIS professionals, there are equipment, installation, training and service costs to consider. The first step for both groups, therefore, must be to determine what advantages the new operating system offers information management. •

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Store more, spend less: Mid-range options abound

BY NINAMARY BUBA MAGINNIS

Hard disks just aren't what they used to be. In the 200M- to 700M-byte range, they are cheaper, denser and smaller than ever. Look, for example, at disk form factors. For mid-range systems use, the original 14-in. hard disk now faces competition from smaller 10½-, 9-, 8-, 5¼- and, in some cases, 3½-in. disks.

Next look at capacity. Today's disk engineers pack as many as 765M bytes — or 43 million bits per square inch — on a 5¼-in. unformatted disk.

Then there is the issue of cost-effectiveness. Not only are smaller hard disks less expensive to purchase than their rigid big brothers, but the smaller disks operate with less electricity, so they are cheaper to run.

Last but not least, compact, 5¼-in. drive arrays (at least one product has already been announced) can promise the 1.5G bytes of storage that are provided by four synchronized disk subsystems operating in parallel.

While this is all good news, it does not necessarily mean current models of the big disks are outdated. Some applications are bound to require the higher capacity and performance found in these disks.

If you are in the market for new mid-size system storage devices, the three most important questions you can ask yourself are these: What are my data-access or transfer-rate needs? Do my users have special storage requirements; for example, do solid modeling or other storage-intensive tasks need support? And, is space at a premium in my facility; if so, are smaller form factor drives or drive arrays the answer?

"As the DASDs get more condensed and pack more bytes, your bottleneck becomes the transfer rate," says Bob Oshinsky, operations manager at Accredited Computer Services of Cleveland, Inc., a savings and loan organization.

"If a channel can transfer only 3M bytes at a time, it doesn't do much good to get the latest technology on disk. You need that transfer rate to increase — to keep in step with the DASD technology — or else you're just switching the bottleneck in the line so it's found someplace else," he says.

Oshinsky is responsible for an IBM 4341 and two direct-access storage device (DASD) strings that are composed of eight disk drives from Memorex Corp., based in Santa Clara, Calif. Instead of IBM 3375 Winchester disk drives, Oshinsky operates twin device strings that include two Memorex 3695 subsystems sandwiched between 3698 head-of-string and 3697 tail-of-string devices.

"The 3697 allows you to access data from the head-of-string, or the first device, and if that channel is busy, you can come through another channel — the tail-of-string — and access data," Oshinsky explains. He adds that IBM did not offer such a configuration when he was shopping for DASD.

However, even Accredited Computer Services' setup, designed for optimum response time because of its all-day, all-night on-line operation, could benefit from the faster transfer rates, Oshinsky maintains.

Adds Lee Eliser, president of Peripheral Strategies, Inc., a data storage consulting firm in Santa Barbara, Calif., "I think data access is probably the key bottleneck in most computing environments. The faster you can access the data, the better your application can perform."

The space crunch

Stan Rose, vice-president of distributed processing, technical support for New York-based Bankers Trust Co., is also looking for more speed and faster

BART GOLDMAN

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What to do when you're out of space
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Prices plummet in the 5¼-in. market
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Maginnis is a free-lance writer based in Webster, Mass.

Options

FROM PREVIOUS PAGE

access time.

Perhaps the only other pressing on-line storage problem Rose has is lack of physical space. Like most New York MIS shops, the computer room at Bankers Trust is tightly squeezed. Sometimes it is enough to worry about where to put another CPU, let alone its accompanying Winchester disk drives.

"In Manhattan, footprint is very important," Rose notes. "We have several hundred disk drives, and no matter how small they are, when you multiply them by the very large number we have, they take up a lot of space."

At Bankers Trust, more than 50 Digital Equipment Corp. VAXs, ranging from an 11/750 to an 8700, operate in several clusters. All the installed drives are either 14-in. 456M-byte RA 81s or 622M-byte RA 82 formatted disks.

"One of the things that helped us most recently," Rose says, "was the conversion of the three-high to four-high cabinet. In fact, we'd just as soon go five-high because the vertical space is wasted above the drive."

"Space is always an issue," says David Manns, executive vice-president of systems at Instinet, Inc., a New York-based service company that operates a stock information and trading network.

Instinet's computer operations are located in Bedford, Mass., and consist of almost 50 DEC systems, a mix of PDP-11 and Microvax machines.

"We're trying to avoid things like floor-standing drives," Manns says. "We look for systems that rack-mount in the same cabinets with the actual CPUs. For that reason, small-array technology would be interesting as we [study our] space requirement."

Drive arrays

Small-form-factor hard-disk arrays, according to vendors and analysts, provide one more option for MIS professionals in the market for fast, high-capacity storage devices.

According to Peripheral Strategies' Elizer, 5¼-in. drive arrays will find themselves in technical and engineering design applications, such as three-dimensional solids modeling and seismic analysis, as well as business applications like transaction processing.

Multiuser environments, in which several people try to get at a single data element, will notice faster response times with drive arrays, Elizer reports. "Drive arrays can become a definite trend," he claims. "Numbers like '20% faster' can mean a lot."

Jim Moore, industry analyst at Dataquest, Inc., a San Jose, Calif.-based consulting firm, predicts arrays will be found in applications such as computer-aided design and computer-aided engineering as well as mainstream business applications.

"I'm expecting, as I think most people in the industry are, that the idea of large data transfers are going to be more common, even with the business computers of tomorrow. Right now, IBM is sitting at about 4.5M bytes per second. But we would expect that factor to continue to increase.

"In effect, the devices, subsystems and arrays like the one now offered by Micropolis are solutions for business problems in the not-so-distant future," Moore says, referring to the Chatsworth, Calif.-based manufacturer.

By configuring several hard disks in an array, manufacturers of the smaller, dense hard disks will be able to design subsystems that operate in parallel and surpass or equal the capacities of some larger platters, Moore contends.

In a drive array, several subsystems operate in parallel and appear to the computer as one large storage device.

"When you speak of a drive array, the preferred definition at Dataquest is that for one 8-bit byte of data coming to the system, you're taking one bit off each of eight drives and probably a parity bit from a ninth drive," Moore says.

Therefore, a subsystem with four 380M-byte 5¼-in. disks operating in parallel would look like one 1.5G-byte device and perform transfers approximately four times faster than a single disk, he explains.

The first true array

Both Jim Porter, president of Disk/Trend, Inc., a market research firm based in Mountain View, Calif., and Dataquest's Moore assert that Micropolis Corp. was the first manufacturer to announce a bona fide 5¼-in. drive-array product.

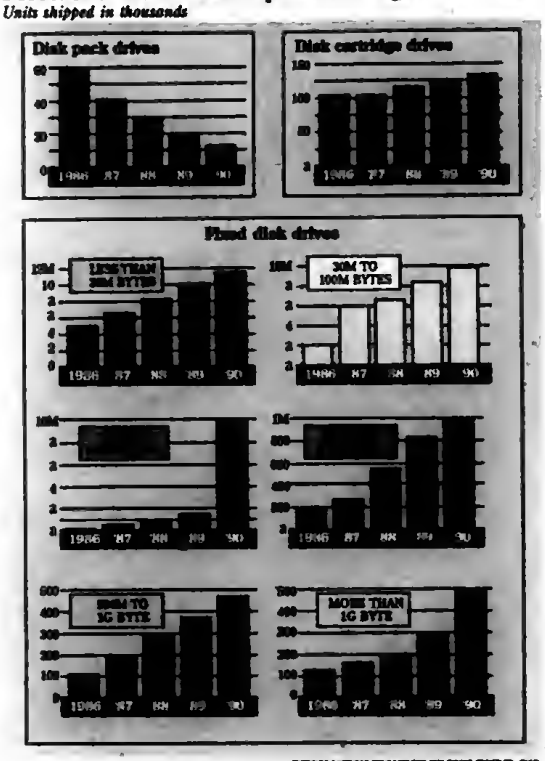
The manufacturer makes only 5¼-in. hard disks and announced earlier this month its Parallel Array 1800 series, a 1.5G-byte array that Micropolis claims operates with the popular small computer systems interface (SCSI).

The 5¼-in. drive array, called Model 1804 SCSI and scheduled for shipment in first-quarter 1988, will reportedly offer a mean time between failures of more than 140,000 hours and data transfers of 5M byte/sec.

The manufacturer is positioning the product as a less costly alternative to the high-performance 8- and 9-in. Winchester drives. According to the vendor, the drive array makes use of four synchronized, standard Micropolis 380M-byte 5¼-in. drives operating at a speed of 1.25M byte/sec.

The Model 1804 SCSI fits Dataquest's stringent definition of a drive array, according to

Forecast of worldwide shipments of rigid disk drives
Units shipped in thousands



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CW CHART

Big competition in small disks

Smaller disks are in, or so some industry analysts say.

Jim Moore, an analyst at Dataquest, Inc., a San Jose, Calif.-based consulting firm, says he expects end users to favor the smaller disks, bypassing the 8-, 9- and 14-in. form factors.

Bob Abraham, vice-president of Freeman Associates, Inc., a Santa Barbara, Calif.-based data storage consulting firm, agrees that the trend is moving steadily toward smaller and more densely packed hard disks.

Hot activities

"One of the hottest activities," Abraham says, "is in the very high-performance 5¼-in. disk market where you're finding 370M-byte and 760M-byte products. There's a great deal of interest among computer manufacturers for the smaller drives." In fact, Abraham predicts, within a year, many manufacturers will be competing fiercely with each other for this space. "I expect a great deal of competition," he concludes.

End users may find smaller disks more attractive because they can cost far less than their larger counterparts, says Jim Porter, president of Disk/Trend, Inc., a market research firm based in Mountain View, Calif. If you compare the cost per megabyte of an 8-in. and 5¼-in. hard disk, the smaller form will most likely be less expensive.

"A 300M-byte 5¼-in. disk will have a lower price per megabyte because there are more produced, and industry expense in quantities is hierarchical," Porter says, explaining that, as with other industries, when the manufacturers gear up to produce higher quantities, costs generally drop.

In addition, smaller form factors require lower wattage to stay up and running and may retrieve information faster than larger disks, reports Lee Elizer, president of Santa Barbara, Calif.-based Peripheral Strategies, Inc., a data storage consulting firm.

Disk/Trend's Porter ALAN WITSCHONKE

According to Skip Kilsdonk, Maxtor Corp.'s marketing director, a 5¼-in. high-performance disk requires about 30 to 35 watts of power, and a 3½-in. disk needs only 10 watts or less.

In comparison, 8- and 14-in. platters require hundreds of watts of power.

"You just don't have 100 watts available in the Tower, PC or Microvax. Those systems are designed with lower power to run cooler," Kilsdonk notes, referring to NCR Corp.'s, IBM's and Digital Equipment Corp.'s products, respectively.

However, don't expect IBM's 14-in. disk to fade away just because smaller disks may be on the upswing, cautions Dave Vellante, a data storage specialist at Framingham, Mass.-based International Data Corp., a market research firm.

Because of high capacity and performance requirements, mainframe applications do require the larger form factors and will continue to use them for the next few years.

Yet their fate does depend on the vendor's continued use. "As soon as IBM kills the 14-in. disk, it will be dead," Vellante says.

NINAMARY BUBA MAGINNIS

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Moore. One of those requirements is what Bankers Trust's Rose is looking for in such a subsystem. "What I would like to see is a drive array that did not use one hierarchical system controller per drive in the array," Rose observes. "All the vendors I've looked at, I believe, are using one hierarchical system controller port per drive in the array."

Micropolis also claims its new drive array operates in parallel through an on-board synchronous SCSI controller that allows the system to appear as a single 1.5G-byte drive to the host. The array reportedly can provide a sustained data rate of more than 4M byte/sec.

A fifth drive operates in parallel as a parity drive to help increase data integrity and system reliability, the vendor claims. If four comparable drives were not running in parallel, a drive failure would shut down the system, and valuable data would be lost, Micropolis says.

What will the market say?

Disk/Trend's Porter asserts, "There'a oo question about [Micropolis's] ability to produce and support the drive array." Porter'a concern is whether the commercial marketplace will accept the product. He says image storage systems, supercomputers and minisupercomputers will probably benefit from a drive array such as the one Micropolis is planning to offer.

But Accredited Computer Services' Oshinsky says the Micropolis array interests him. "It's something I would like to take a look at," he says. "We're going to be looking at relocating, and I may not take any of the DASDs I have here but move to the next step — whatever that might be."

One of the problems with arrays is that without error-correction code or a costly, built-in redundancy, they would put data at risk, claims Mike Randall, product manager of packaged subsystems at Emulex Corp., a Costa Mesa, Calif.-based disk manufacturer that sells to OEM houses and end users.

However, he says, a properly configured disk array could avoid data loss.

"[With error correction code], if one drive represents a bit stream, then a single bit failure can be corrected on the fly," Randall says.

"The subsystem could correct the failure, and system operation would be totally unaffected, totally unaware that a drive has failed," he adds.

Varied vendors, varied terms

If you're in the market for array technology, be aware that not all vendors use the term identically. Dataquest'a Moore cautions, "Manufacturers may define an array as simply a box full of drives — but they're not working in parallel."

DEC's SA482 and Cupertino, Calif.-based Tandem Computers, Inc.'s V8 and XL8 fall into this category, he notes. But storage products like the SA482, the V8 and the XL8 are useful for other types of applications.

"Our disk products are for on-line transaction processing," notes Derek Ginger, Tandem's product manager for storage products. "If we made the eight [drives] look like one, the subsystem would perform only one operation at a time," Ginger maintains.

"Our other concern is that the operating system might lose control if there is too much intelligence in the subsystem. We really need to know when the data is

Continued on page 76

How to downsize a computer room: Space-saving tips

BY KELLY SHEA

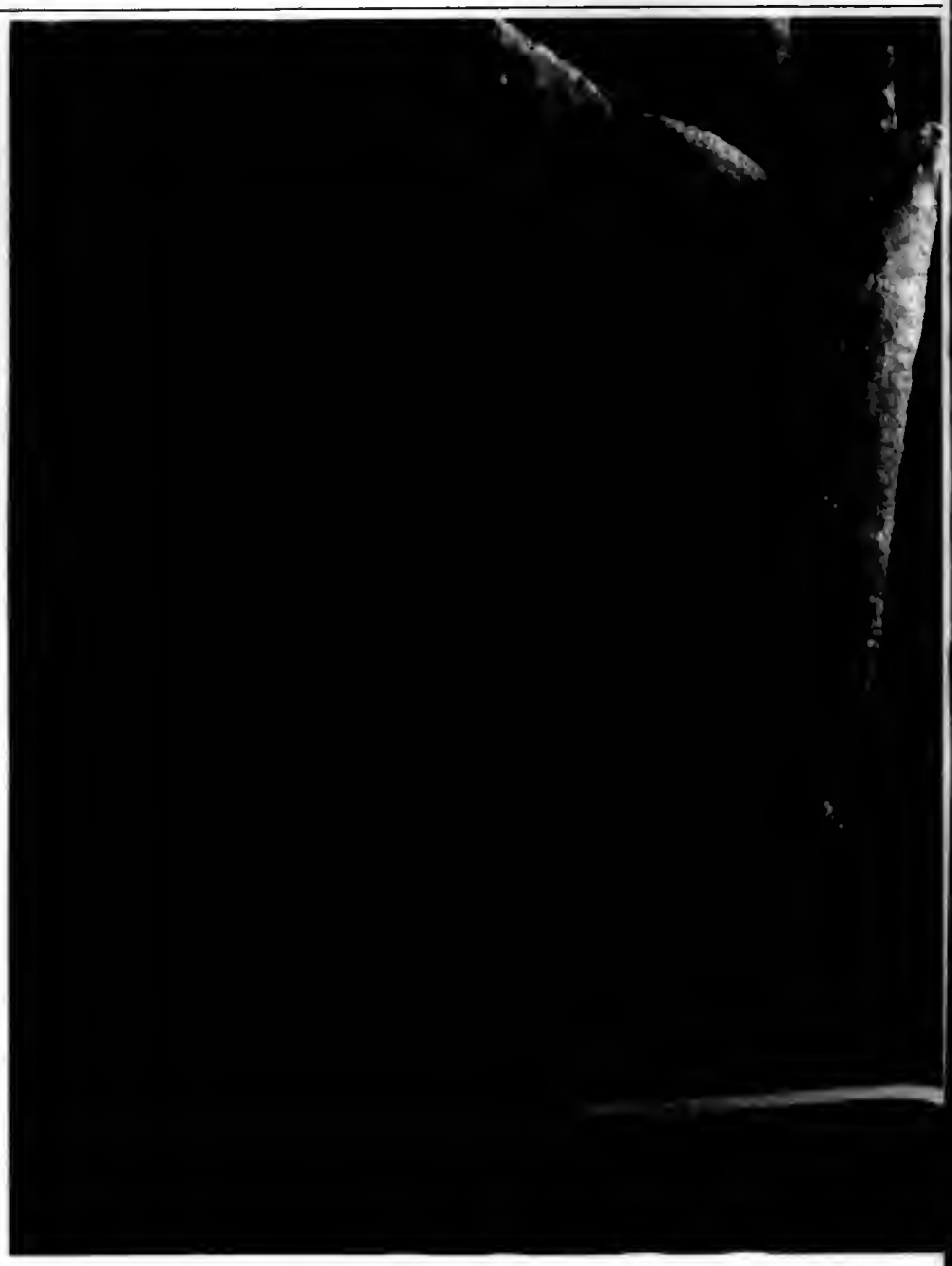
What can the innovative MIS manager do to increase his on-line storage when he runs out of either physical or memory space? Richard Kolm found himself living part of that DP nightmare. As the MIS director at WNET, New York's public television station, Kolm was told to cut his computer room space by 40%.

"We're a company that has constantly growing ambitions but oo available space," Kolm says. "And even if [space] were available, it wouldn't be affordable." Although the television station owns nine floors of its midtown Manhattan office building, its growth would have required it to lease another floor and renovate or go to a remote site. Both options were deemed too expensive.

So, in addition to distributing some operations to various departments and rack-mounting some equipment, Kolm changed his method of making on-line storage available to his mid-range shop. With one IBM System/38 and eight IBM System/36s, his previous storage method consisted of four 3370s — IBM'a original System/38 disk storage technology — which store only 571M bytes each.

What Kolm did was buy up. He went to the IBM 9335, which, with the same footprint as the 3370, houses up to 3.4G bytes of data with four stacks of 850M-byte units. As Kolm puts it, he was lucky. "We caught a fairly good juncture in the generations of technology. We were able to order the 9335 very early," he says. On the whole, Kolm claims, the downsizing has been successful, mostly due to

Shea is assistant editor, features, at *Computerworld*.



measures not especially innovative. "You have to push yourself over some technical hurdles, but basically we didn't do anything terribly pioneering."

Fortunately for Kolm's peers, not all computer rooms have to undergo such drastic space cuts. At Hunter Douglas, Inc., a window-covering components manufacturer and distributor in Upper Saddle River, N.J., MIS director Mike Sidrow needs more disk space just every two years or so.

However, Sidrow, who also runs a System/38 shop, has avoided going from his 3370s to the 9335s. Without the physical space constraints that Kolm has, it is simply a matter of economics, he says.

"On a per-megabyte basis, it's much cheaper to stick with the 3370 until we run out of capacity on the existing controllers," he adds. "Then it's more cost-effective to consider going to the newer technology."

SERIOUSLY CONSIDER rearranging the way you allocate your physical space, especially if yours is an old computer room that developed in haphazard, unplanned ways. It may only seem crowded.

Currently, Sidrow does not foresee increasing his storage capacity before 1989. And he claims he certainly has no plans to replace the 3370s. But will he ever buy a 9335?

"It's hard to see what would make us do that," Sidrow says. "With the rumors of Silverlake [IBM's System/38 follow-on], we'll have to see what happens."

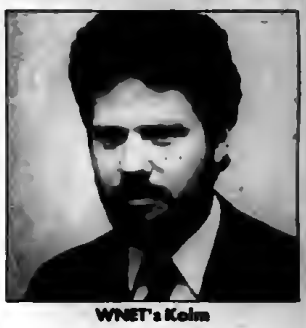
The soft route

There are other ways of making more on-line storage space available to the mid-range DP shop. You don't have to "kill it with hardware," as one MIS director puts it. John L. Breyer, U.S. product manager for Digital Equipment Corp.'s Decsite Services, suggests choosing one of three options. He primarily advocates planning ahead for the eventual need of additional physical space.

"When you build the initial facility, you may not be able to get access to the adjacent area immediately. But you can develop a plan that says, 'This year I'm going to take this space, but I'm going to design the system so that in six to 36 months, I'm going to take the next two offices and tear down the walls and turn them into computer room space.' "

If it is too late for preplanning, you might get lucky, Breyer says. As Kolm's did, your timing could coincide with a major technology change. When that happens, Breyer says, "quite often you can look at changing your storage devices."

Third, Breyer suggests seriously considering rearranging the way you allocate your physical space. This might especially apply if yours is an old computer room that developed in haphazard, unplanned ways. It may only seem crowded.



WNET's Kolm

As Breyer puts it, "If you think you're out of space, go back and take a hard look. It's entirely possible that there's enough room in that existing facility for everything you need, by reorganizing it."

Another option, some suggest, is to go into existing software applications and reprogram, restructure files and change the way disk space is allocated. This course, however, often merely gets put on a wish list because of lack of time or personnel.

Not-yet-ready solutions

If you can wait long enough, there are some technologies on the horizon that will revolutionize the way data is made available on-line, according to consultants at Total Assets Protection, Inc. (TAP) in Arlington, Texas.

Developments in writable compact disk read-only memory storage and off-site electronic vaulting — an area in which a TAP subsidiary provides services — are likely to change the face of on-line data access, says TAP Group Vice-President Ed Coggins. Larry Compton, senior vice-president at TAP, says darkened remote data centers or tape cartridge silos could provide even more options.

In time, WNET's Kolm just might need to use another new storage technology, because he does not foresee getting any of his old space back.

"If anything, I think they'd want us to decrease it again. We can manage for a year or two, at which point I'm hoping IBM's rack-mounted processors will come out. I think the whole industry is going in that direction. Perhaps the CPU itself will also be rack-mounted, which will free up some more square feet for us."

Here's hoping. •

What ISDN is doing for McDonald's data networking capabilities is no small potatoes.

When McDonald's Corporation took a hard look at its telecommunications needs a few years ago, it saw 9400 restaurants in 46 countries, served by more than 20 networks. And a new restaurant opening every 17 hours.

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Thanks to ISDN, McDonald's will enjoy better customer service, more current market information, better tracking of product promotions, more efficient inventory control, and reduced administrative workloads.

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Options

CONTINUED FROM PAGE 74

physically committed onto magnetic disk.

"Typically, with a SCSI, there's a lot of buffer," he continues. "If it's not managed correctly, you can tell the system to write, and if the system takes a power hit in the middle of the operation, you don't know whether data is still in buffer or on the magnetic disk itself."

The vendor's V8 encases eight 8-in. drives that can each hold 165M bytes of unformatted capacity, or more than 1G byte total. Tandem's XL8 fits nine drives, each capable of 525M bytes of unformatted capacity, for more than 4G bytes of storage, Ginger reports. Both subsystems fit into compact 2- by 3-ft cabinets, he adds, but actually look like eight separate drives to the system.

According to Sharon Lewis, a product expert in the DEC subsystems group, the vendor's SA482 consists of four independent RA 82 drives. Although the 2.5G-byte formatted device looks like one storage unit to the system, each RA 82 drive has its own port, Lewis says.

How about smaller disks?

Many hard-disk vendors are now concentrating their efforts on 5¼-in. platters and the smaller 3½-in. disks.

Already, San Jose, Calif.-based Maxtor Corp. and, more recently, Micropolis offer 760M-byte unformatted disk drives in the 5¼-in. form factor, Disk/Trend's Porter says. Other hard-disk manufacturers, like West German Siemens AG, will follow suit, he adds.

Porter also says he expects Minneapolis-based Control Data Corp. to soon announce its Wren 5, a 770M-byte, 5¼-in. disk. According to CDC, its densest 5¼-in. platter, the Wren 3, offers 574M bytes of formatted capacity.

With developers concentrating their energies on the smaller disk arena, some analysts and vendors say the increasingly popular 5¼-in. disk may well emerge as the industry standard in the next decade.

According to Dave Vellante, storage specialist at Framingham, Mass.-based research firm International Data Corp., "There's a good possibility all higher end disk drives will be replaced by the 5¼-in. drive. In the 1990s, I think you'll see all different diameters, but the vast majority will go to 5¼. It may be possible that the 3½-in. may infiltrate later, in the '90s."

Other analysts dissect the smaller hard-disk market more cautiously. Santa Barbara-based Freeman Associates, Inc.'a Vice-President Bob Abraham observes, "I think there will be a continued improvement in reliability, power consumption reduction and cost reduction in the 5¼-in. market. As those things occur, their appeal will increase, and then there will be some eventual acceptance, even in larger systems."

Not everyone, however, agrees that size standardization favoring smaller disks will occur. A segment of vendors and analysts argue that the various disk sizes may serve specific purposes, and the real differences will emerge in disk subsystems.

"I think there is enough diversity in people'a needs and requirements," Emulex'a Randall says. "There is a need, and there continues to be a need for a variety of solutions. In the mainframe world, people will continue to use the larger, 14-in. type drives."

When 5¼-in. drives achieve 1G-byte

Peripheral Strategies' Elizer

capacity, 8- and 14-in. disks will be able to store between 4G and 5G bytes, Randall notes. "There will always be that differentiation in storage capacity. I think people will migrate toward each of those groups," he predicts.

Although the trend may be moving toward smaller form factors, Natick, Mass.-based subsystem reseller EMC Corp. sells only 8- and 9-in. platters in its subsystems. "We'll market whichever technology allows us to provide the most reliable, most cost-effective solution. And when, to our measurements, it'a 5¼-in., then sure, that's what we'll look at," says Brian Fitzgerald, EMC'a marketing communications manager.

IBM'a role

While IBM continues the 14-in. tradition for its mainframe systems, the computer giant today delivers disk subsystems for its 9370 minicomputer that are also compatible with its System/36 and 38 machines. IBM has adhered to the 14- and 8-in. form factors for mid-range systems, the vendor says. The company favors 14-in. platters, claiming they offer customers the best price per megabyte of any size disk drive in mid-range systems applications.

For its mid-range System/36 and 38 computers, IBM now offers the 9332 and 9335 DASDs. The 9332 comes in both 200M- and 400M-byte formatted capacities, according to the vendor.

The System/36 can use only the

Continued on page 78

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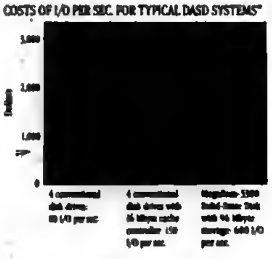

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They may be slow, they may be heavy, but sometimes WORMs work best

BY BARBARA SEHR

Robert A. Zeek, a senior projects analyst at Pfizer, Inc. in Groton, Conn., is not operating under any optical illusions about the performance of write-once read-many (WORM) on-line storage disks.

He says that compared with IBM 3380-type Winchester technology, WORM disks perform like an out-of-tune family station wagon. However, the clunky disks hold a key advantage for the pharmaceutical research in which Zeek is involved. Once data is written to disk, it can never be erased or overwritten.

"We don't see magnetic [disks] as even being in the ball game, because we want write-once," Zeek says. "We don't want erasable. We don't even want erasable optical."

Among the data Pfizer stores on its WORM disks are graphs of the spectrum of a chemical. Prior to optical disks, computer comparisons of these graphs could date back only about six months. Now the company can store data on optical disks dating back several years. For that reason, data security is of the utmost importance. "We want to know that we can compare that for years to come," Zeek says.

Zeek is in the process of expanding Pfizer's use of optical disks. The company has published specifications for an optical disk subsystem to hook into its Digital Equipment Corp. VAX 8000 series CPUs. The specs call for a system that will handle from 6G to 10G bytes of optical storage and another 6G to 10G bytes of magnetic storage.

Limitations on space as well as the write-only factor are turning the company's attention to higher capacity optical storage. Zeek says the company is also looking forward to DEC's forthcoming RA 90 series.

However, Zeek says his company is sold on the future of WORM disks for upcoming storage needs. "It's not a question of technology anymore," he says. "It is a question of finding something that fits into our corporate style."

Removability of the media is also important to Pfizer, Zeek says. Removability means an optical platter can be stored in a more compact space; furthermore, years of data can be available within reach on a shelf, and unlike paper documents, they are hard to lose.

"The nice thing about this technology is that you can store documents on the computer and they don't wander out of the file," Zeek says. "We can keep track of those documents. We know what we have in-house, we know its status, and we can share documents."

Pharmaceutical companies are not the only users turning to WORM disks rather than magnetic disks for data security purposes. Banks, insurance companies and government agencies are taking advantage of the permanence and removability of the relatively young technology, despite its shortcomings in access speed. "To these industries," says analyst Ray Freeman, president of Freeman Associates, Inc., a Santa Barbara, Calif., storage research firm, "it is preferable that the data can't be altered in order to provide a permanent audit trail."

WORM benefits

These organizations can also overcome the relatively slow performance of WORM disks by using high-end magnetic disk systems to act as a cache memory to achieve the much-improved access of Winchester technology. WORM disks access data at an average access time of about 100 msec, at least five times slower than most Winchester disks.

> MAGNETIC DISKS have the potential to ultimately achieve more capacity than optical disks.
>
> RAY FREEMAN
> FREEMAN ASSOCIATES, INC.

But Zeek points out that most users do not require all of the data on an optical disk at any one time. Therefore, data can be accessed from the WORM disk and cached on the Winchester for on-line retrieval, and the user will not notice any difference in performance — except for the initial access.

As a result, WORM disks may prove a benefit to high-end magnetic systems, Zeek says. "Optical disks will cause more magnetic disks to be sold, not less," he adds.

Charles Plesums, acting director of systems research at San Antonio-based United Service Automobile Association (USAA) — one of the nation's largest insurance companies — says even the relatively slow performance of WORM disks is preferable to the filing cabinets of days gone by. "Instead of having someone look through file cabinets for several hours for a particular document," he notes, "we can access the data while the customer is still on the phone."

Plesums says he does not believe WORM disks will ever equal the performance level of Winchester-technology magnetic disks. "In comparison [with magnetic head-disk assembly, WORM is] a very heavy mechanism," he says.

But the USAA upholds storage requirements that far exceed the needs of Pfizer's research center. As at Pfizer, hardware occupies a great deal of limited floor space. Already the company has a new building on the drawing board that will give its computer room 120,000 square feet of additional space. Its optical disks are already approaching one terabyte — 1,000G bytes — of capacity. If it were not for the added capacity of optical disks, the floor space for magnetic disks of equivalent capacity would require still more construction.

> "INSTEAD OF someone looking through file cabinets for a particular document, we can access the data while the customer is still on the phone."
>
> CHARLES PLESUMS
> UNITED SERVICE AUTOMOBILE ASSOCIATION

Analyst Freeman points out, however, that magnetic disks are making great strides in improving storage capacity within a smaller space. In fact, Freeman says, magnetic disks have the potential to ultimately achieve more capacity than optical disks. "It has to do with the limitations in refraction of light," Freeman says. "Optical disks depend on how small a spot one can resolve with a beam of light."

Another analyst, Robert Katzive, vice-president of Disk/Trend, Inc., a Mountain View, Calif., research firm, says he expects optical disks to represent only a fraction of magnetic disk shipments in the immediate future. By 1990, Katzive predicts, shipments of erasable optical drives will total 420,000 — about 162,000 for WORM drives. Most of the latter will be shipped to users like Zeek who demand the security of a write-once, removable cartridge. ●

Sehr is a free-lance writer based in Seattle.

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Options

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200M-byte version, while all System/38 models can take advantage of both capacities, IBM claims.

Last month, IBM introduced its first 5¼-in. footprint for its System/36 Model 5364 and for the entry-level System/36, the Model 5363.

The 5¼-in. hard disk is the same one IBM uses in its Personal System/2, but the disk is formatted differently for the System/36. For high-capacity requirements, a configuration of two disks can store 210M bytes. "In some applications, the trend toward smaller-size files is necessary to provide the right product to solve the customers' needs and applications," an IBM spokesman explains.

In the IBM world, only the 8- and 14-in. environments offer capacities greater than 500M bytes, the spokesman adds. "As capacity and performance of the sub-8-in. drives improve, smaller-size files will grow in use in mid-range systems," the spokesman says, adding that IBM will not speculate on unannounced products.

The IBM 9335 subsystem achieves 855.8M bytes of formatted capacity and hooks into all System/38 and 9370 mid-range systems, the vendor claims.

Outside the IBM world

EMC's 9-in. Winchester disk subsystem competes for computer room floor space with the IBM 9335, EMC's Fitzgerald says. EMC's Guardian uses two subsystems running in parallel that appear to be one large disk unit to the IBM system.

The Guardian actually emulates the IBM 9335, Fitzgerald claims.

When Rutherford, N.J.-based Howmedica, Inc. was looking for a faster hard-disk subsystem, the division of Pfizer Hospital Products Group, a Pfizer Co., chose EMC's Guardian.

That product promises to be 20% faster than IBM's 9335, says Paul Donahue, Howmedica's computer center manager.

"We ran benchmarks, but we haven't been able to prove or disprove EMC's claims," Donahue reports, explaining that problems with the System/38's performance monitoring software impeded the gathering of reliable results. Although the Guardian product is less expensive than the 9335 subsystem, Howmedica did not consider cost to be an issue, according to Donahue.

> "SIZE IS very important. We have limited space here. If we can pack more into the same area — the more, the better."
>
> PAUL DONAHUE
> HOWMEDICA, INC.

The promise of faster I/O however, was. Howmedica has one System/38 Model 700 running at maximum capacity with another 38 on order.

"The more work we can get done on one machine, the better," Donahue observes.

EMC's Fitzgerald claims its Guardian subsystem uses two physical drives as one logical device. The Guardian system works both with mid-range System/38s and the newer 9370 computers.

Both the IBM 9335 and EMC Guardian are roughly one-fifth the size of the old 3370, IBM's original subsystem for the System/38. "Size is very important," Donahue says. "We have limited space here, and the company is not willing to allocate more space. If we can pack more into the same area — the more, the better."

DEC's contribution

One of IBM's biggest competitors in the minicomputer marketplace — DEC — currently adheres to 14-in. hard-disk technology for its VAX minicomputers, according to Irv Lyle, DEC's storage marketing operations manager.

Yet the RA 70, a 280M-byte formatted 5¼-in. hard disk that was announced this fall, runs

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Aided by a tiny, heat-sensitive microchip "sandwich", astronomers are experiencing a quantum leap forward in infrared astronomy. The Hughes-built detector device is placed in a camera-like system and attached to the bottom of an infrared telescope. Called an infrared focal plane array, the device contains nearly 4,000 detectors which sense the radiant heat energy emitted from heavenly bodies and turn it into clear, sharp images in record time. Astronomers will be able to use the array to study the planets in our solar system, the center of the galaxy, and millions of other galaxies in greater detail than ever before. The array was first used in the United Kingdom Infrared Telescope (UKIRT) in Hawaii.

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exclusively on the company's 3000 series Microvaxes, Lyle reports.

The key word when talking capacity is "formatted," Lyle says. "We talk about user capacity, which is more fair than talking about unformatted capacity."

DEC is currently exploring ways to reduce disk size but not in direct response to users' requests.

"Users do not ask us for a certain disk size diameter," Lyle says. "They say they would like to save on floor space and power consumption. They do not say they want us to deliver disk capability in some diameter of disk. They say, 'Give me a disk that optimizes my application and access I/O.' "

Although DEC's SA482 uses four 14-in. RA 82 disks, Lyle claims the vendor is exploring smaller form factors, but only if it can supply the right capacity and speed.

The vendor does not limit a system to a specific form factor. The Microvax, for example, can use a 14-in. high-performance disk drive for certain applications in which large contiguous files, high-capacity needs and high data throughput are the order of the day. A time-sharing environment or seismic analysis program would require the large disk for optimum performance, Lyle explains.

Selected players

In the 5¼-in. market, Micropolis offers the 1560/1580 drive, one of the densest 5¼-in. drives in the industry, according to Disk/Trend's Porter. Unformatted, the drive can store up to 765M bytes, the vendor claims.

Micropolis plans to pitch its high-capacity 1560/1580 drive against older 8-, 9- and 14-in. drives, claiming its 15-MHz transfer rate and 16-msec. seek time can help users develop low-cost, smaller systems.

Dataquest's Moore says, "This is opening up a hole in the market for them. Before the two drive products [were introduced], Micropolis was tied to the growth rate of microcomputer activities. Now they will be able to break out of that environment and run toward the minicomputer market."

Competitor Maxtor has been shipping a 5¼-in. 760M-byte disk for more than eight months, according to Maxtor'a marketing director Skip Kilsdonk. The manufacturer takes a backseat to Micropolis when it comes to drive arrays, however.

The company is studying drive arrays and predicts that most drive manufacturers will offer arrays two years from now, Kilsdonk reports. Maxtor also manufactures a 3½-in. disk and announced a write-once-read-many optical disk format for the 5¼-in. market.

The sputter factor

One reason 5¼-in. disks are achieving such high capacity is the way they are made, notes IDC's Vellante. The oxide coating can be effectively sputtered on a smaller disk, allowing for more bits per square inch, he reports. When trying to sputter thin film on larger diameter disks, there is less chance of producing a reliable storage media, he says.

San Jose, Calif.-based Fujitsu America Corp. refuses to embrace the method, according to Michael Nalls, the firm's marketing communications manager, computer products group. "We have increased the density of our 5¼-in. disks with electronics or with existing oxide media. We feel it'a more reliable,"

Continued on page 82

Disk prices to plummet

The bustle of engineering activity in the 5¼-in. hard-disk arena brings good news to end users: rapid price reductions.

The cost per megabyte of hard-disk storage has steadily declined through the years, but analysts and vendors predict the price will drop even faster in the next two years.

"We continue to see a price erosion in the quotes we make," reports Control Data Corp.'a Chuck Alexander, marketing director of the small-disk division.

CDC user Bob Oshinsky, operations manager for the savings and loan firm Accredited Computer Services of Cleveland, Inc., says, "We're seeing a drop in disk prices, but I don't think it's expensive technology to begin with."

At present, CDC sells its 8-in. form factor disk for $6 to $8 per megabyte, while its 5¼-in. disk costs $4 to $5 per megabyte, Alexander reports.

"There is additional money for the 8-in. drive because it has a higher capacity and a higher transfer rate. An application may not warrant the extra ability, so a user doesn't need to spend the money for it," he adds.

Micropolis Corp., based in Chatsworth, Calif., manufactures only 5¼-in. disks and sells mainly to OEMs. President Stuart Mabon says he expects to see his disks selling for $3 per megabyte next year.

Maxtor Corp.'a marketing director Skip Kilsdonk says, "We really do see prices dropping faster. In the OEM world, prices have gone from $30 to $35 per megabyte to below $5 per megabyte in the last 10 years. DP managers will see a cost of two to three times higher — about $15 per megabyte by the time they see it in their system."

NINAMARY BUBA MAGINNIS

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Options

CONTINUED FROM PAGE 79

Nalls reports.

Fujitsu America sells a complete line of unformatted hard disks exclusively to OEMs, with its largest, a 10½-in. platter, competing against 14-in. competitors, Nalls explains. Most disks are manufactured in Japan, while the 10½-in. Winchester drive is also produced in an Oregon facility.

Getting what you pay for

Fujitsu offers a 10½-in. platter with 689M bytes as its highest capacity. The manufacturer's other high-end products include a 690M-byte 8-in.; a 390M-byte 5¼-in.; and a 77M-byte 3½-in. form factor, Nalls says.

With an average price of approximately $9 to $10 per megabyte in all form factors, Fujitsu is the Gucci of hard-disk brands. The manufacturer's mean time between failures averages 30,000 to 35,000 hours, Nalls says.

However, analysts say Fujitsu's mean time between failures is industry-standard, not industry-exceptional.

Dataquest's Moore notes, "Fujitsu as a company has certainly succeeded with a product line because of their very high reliability. But, from a competitive point of view, by being successful, they've taught the U.S. manufacturers what the criteria are.

"Certainly, I think the company will have to fall in line and become competitive on a cost-per-byte basis," he continues, "because the reliability of drives from a CDC, Micropolis, Maxtor and all those other major players from the U.S. have really started to apply themselves to quality."

Freeman Associates' Abraham

Peripheral Strategies' Elizer says, "The reliability [claim] is just marketing hype, and if it's just marketing hype, then it won't last. Some customers prefer to deal with Fujitsu, and those people will pay a premium to do that. There are other customers that competitively bid everything and will go with the lowest priced producer. And Fujitsu, at that point, needs to determine whether they're going to match the competing prices or not."

Another major manufacturer, Tarrytown, N.Y.-based Hitachi America Corp., also manufactures a full line of hard disks, from the smallest 3½-in. to the 14-in. form factor.

"We wouldn't be in any form factor if it was not profitable," says David Ujita, Hitachi's public relations spokesman for the firm's San Bruno, Calif.-based computer division.

Getting better every day

As technology advances, end users can look forward to less expensive, smaller hard disks that consume less power, take up less floor space and access data faster, notes Emufex's Randall.

But no disk configuration, large or small, will become an overall panacea for storage needs. "I don't think any one solution is going to provide the best answer," Randall says.

And while users will eagerly watch for product announcements, the reliability issue is always there. Only users like Bernard Baltz, chief of information systems for the Public Utilities Commission of Ohio in Columbus, know how that translates into day-to-day computer operations.

During the last week of October, the central, shared state government VAX 8650 and 8700 cluster experienced a disk crash, Baltz reports.

"If we lost information that was filed, that's a catastrophe. That fact that we don't lose information is, in a sense, more important than our uptime," Baltz says.

"You don't ever want to get information compromised — particularly in government, because we're the official record," he continues. "In the government sector, we better be really sensitive to that issue, or we're not doing our job." •

But is it formatted?

When shopping for direct-access storage devices, users should note if a vendor offers an unformatted or formatted capacity.

According to Jim Moore, industry analyst at Dataquest, Inc., a San Jose, Calif.-based consulting firm, unformatted capacity refers to 100% available storage space.

Before a disk can be used, however, it must be formatted with special code to enable it to read and write data.

Usually, formatting eats between 15% to 20% of usable disk space, Moore says.

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Landscape of the industry to come

Big vendors will grow bigger, small vendors will shrink smaller, users will become vendors — where will you be?

BY RALPH WEINDLING and SIGMUND SILBER

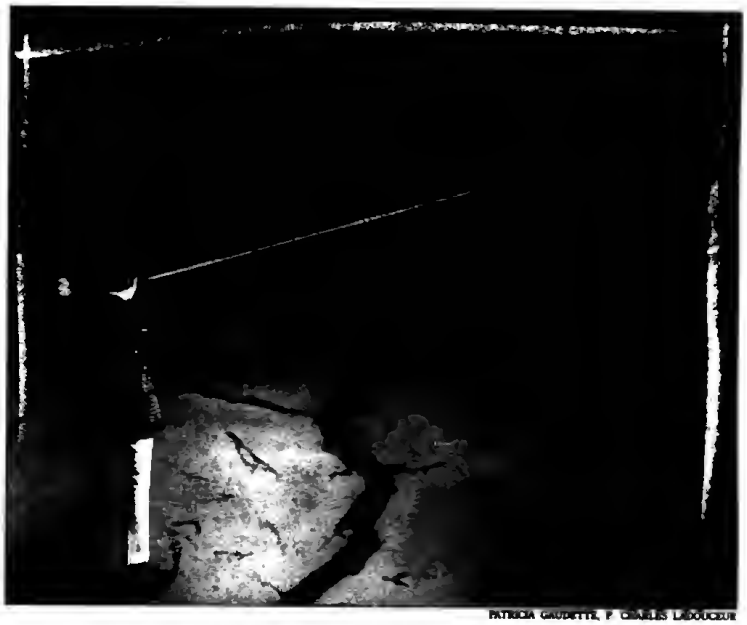
The information technology industry is entering a period of dramatic structural change. Recent mergers, acquisitions and alliances only hint at the upheavals to come. In the next few years, industry segments that are now independent will coalesce, subdivide, transform or die, while entirely new segments will emerge.

These changes pose serious questions for users as well as vendors. To provide a framework for long-range planning in a rapidly changing environment, The Diebold Group, Inc. developed a conceptual model of the industry, projecting its evolution to the year 2000. Our model is based on more than two years of multidiscipline analysis, and it identifies changes as well as forces behind change.

One of the most compelling trends concerns the changing role of the user, or customer. The lines between user and supplier are blurring, with the balance of power gradually shifting to the user.

In addition, a major realignment on the vendor side of the industry is occuring as companies divide into two distinct camps.

Weindling is vice-chairman of The Diebold Group, Inc., a management consulting firm in New York. Silber is associate director of Diebold's Business Planning Division. This article was excerpted from a report, "Evolution and Change in the Information Technology Industry" by Diebold's Business Planning Division.



PATRICIA GAUDETTE, P. CHARLES LABOUCOUR

Today, vendor companies of all sizes operate in all segments, and this trend will continue. Looking ahead to 2000, the industry will polarize into two sectors, with large multinationals at one end of the spectrum and smaller, entrepreneurial companies at the other. Between these two extremes, the mid-size firms — those between $3 billion and $12 billion in annual turnover — will find it increasingly difficult to prosper.

We define the dual sectors as follows:

- Sector I: Commodity products and infrastructure services.
- Sector II: Niches and value-intensive products and services.

The requirements for success in high-volume commodity production have always been different than in areas in which products are heavily differentiated. But it marks a change for the information technology industry to say that products and services are increasingly standard commodities.

These product and service categories are also now subject to international competition. In addition, software development and artificial intelligence increasingly represent a component of research and development activities.

These opposing trends tend to create two very distinct markets with opposite requirements for success — hence the dual-market structure.

Sector differences

There are substantial differences between Sector I and Sector II companies (see chart page

- **A conceptual model through 2000**
- **Mid-size companies dry up**
- **Balance of power shifts to customers**

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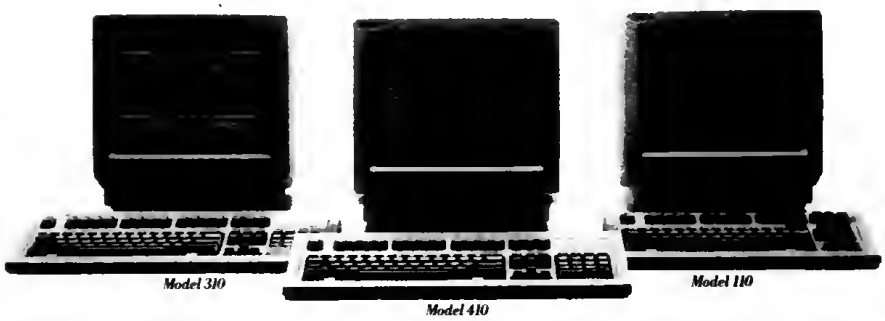

Model 310 *Model 410* *Model 110*

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85). Sector I companies will average $20 billion in annual revenue (measured in 1985 dollars), will compete in capital-intensive businesses with significant economies of scale and substantial entry barriers and will have very high overhead ratios.

There will be very few Sector I companies in each industry segment, but perhaps there will be more successful companies per segment than is the case today. At the same time, there will be far fewer segments.

Sector II companies will be much smaller and more numerous. They will rely on their human resources for their competitive edge, and they will face shorter development cycles.

Sector II companies will generally earn higher rates of return on net assets, but the returns will be highly variable, less highly leveraged and, when measured as a percentage of payroll dollars, significantly lower than returns earned by Sector I companies.

This variability, combined with a shorter product development cycle and dependence on mobile human resources, will lead to a high turnover among Sector II players.

MID-SIZE companies with sales in the range of $3 billion to $12 billion will, in general, find they are competing with both Sector I and Sector II companies.

Sector II companies will not find it necessary to compete in every subsegment within their sector and will often compete only in highly specialized niches.

Discrete sectors

The requirements for success for Sectors I and II do not overlap. The characteristics of Sector I participants are the following:

- High-volume, low-cost manufacturing.
- Manufacturing process technology.
- Quality control.
- Organizational control.
- Worldwide presence.
- Backward and forward integration and control.
- Channels of distribution and a customer base.
- Financial resources.
- Political and regulatory influence.
- Credibility.

Larger companies will be increasingly international in scope, and they will concentrate on low-cost production rather than on advancing the state of technology.

New technology is increasingly the province of small, creative companies. These Sector II participants show a different set of characteristics, which are as follows:

- Entrepreneurial emphasis.
- Highly skilled and motivated labor force.
- Market awareness.
- Rapid response to market windows.
- Access to required manufacturing capacity and technology components.
- High functionality technology; heavy research and development.

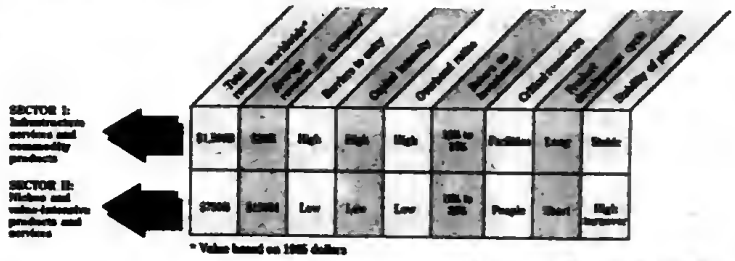
Mid-size companies with sales in the range of $3 billion to $12 billion (in today's dollars) will, in general, find they are competing with both Sector I and Sector II companies.

When competing with Sector I firms, these mid-size companies may find they are ton small to achieve the required scale, international scope and regulatory or political influence.

On the other hand, when competing against smaller entrepreneurial companies, they may find they are

Emergence of the dual market

By the year 2000, the industry will polarize, leaving large multinationals, small niche companies and nothing in between



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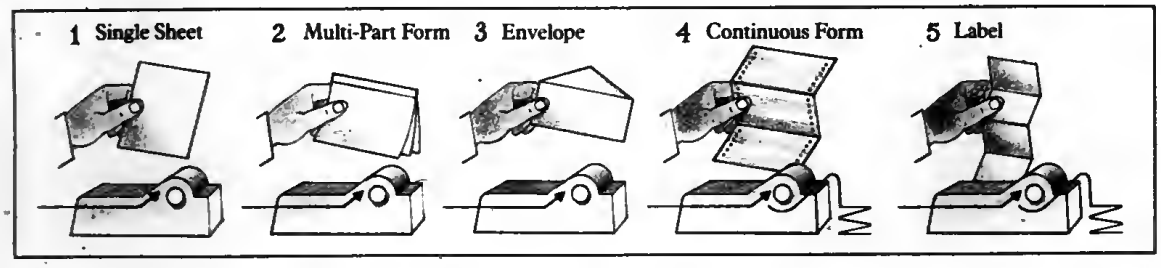

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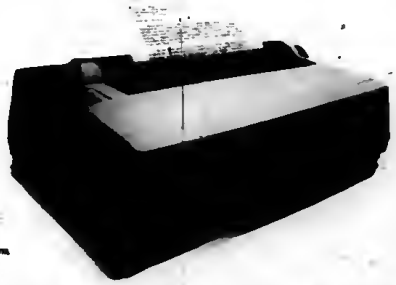

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insufficiently flexible.

Worse yet, mid-size companies may find they need to optimize both sets of requirements at the same time.

Although some companies with a clear idea of how to be a successful mid-size firm will survive, most will need to take a different approach — one that accommodates constraints imposed by the tendency toward a dual market.

Torn between markets

The dual market creates a dilemma, both for large and small companies.

Large companies would like to participate in entrepreneurial growth markets and achieve the higher returns, so they may try to acquire small Sector I companies. But too often, acquiring a small company destroys its effectiveness.

Meanwhile, entrepreneurial companies, as their markets mature, face increasing competition from large multinational firms. They may find they cannot follow their markets without being absorbed by their large rivals.

Therefore, special strategies are required for dealing with the dual market dilemma, such as maturation management, targeting a fixed stage of maturity, rapid transformation, umbrella organizations and staged participation. A great deal of discipline is required for any of these strategies to work.

Another way of looking at the requirements for success is to examine how close your company's products and services are to the ultimate customer.

How many stages away from the final user are you competing? Producers of components would be on the low end of this spectrum, with consumer goods or specialized services on the high end. As you move up the ladder (see chart above) a key ingredient is the level of intelligence incorporated in the product or service.

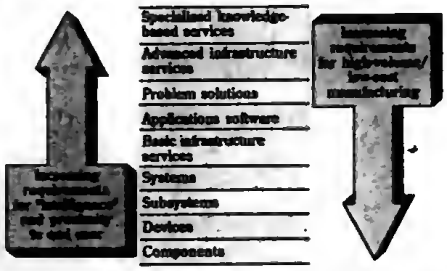
Another key is how much effort your sales force expends to match your product to user requirements. The more effort expended, the closer you are moving to the end user. This is often, but not always, related to the Sector II end of the spectrum.

As you move down the same ladder, manufacturing efficiency is the critical factor. Because the U.S.'a advantage lies in intelligence rather than low labor costs, it is generally desirable for U.S. companies to move up the ladder. Naturally, there are exceptions, and highly automated, world-scale, low-cost manufacturing can be highly profitable if achieved.

The stage of maturity of the individual segment or subsegment provides another useful approach to understanding how requirements for success and appropriate business practices vary as markets develop and mature.

Value added vs. commodity

Components are at the commodity end of the scale, with products moving toward the specialized services end as they gain intelligence



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Secrets of success

Meanwhile, requirements for success are also shifting for user organizations. By being aware of the changing role of customers in the industry, information executives can steer these developments to competitive advantage.

The Diebold Group's research on the changing structure of the industry shows a gradual evolution in the relationship between sellers and users. Many user organizations that have historically been distinct from the information technology industry — from automobile makers to food processing companies to pharmaceuticals — are increasingly becoming suppliers of information technology, both services and products.

In the process, these companies become intermediaries between primary suppliers and ultimate users. They are both channels of distribution for and direct competitors with the traditional information technology suppliers.

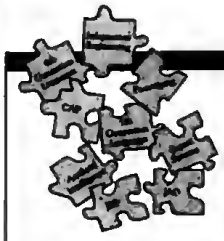
As systems become relatively easy to assemble from components purchased from a variety of suppliers, users will depend less on their primary suppliers. The supplier will not be viewed as the expert on how information technology should be employed but simply as a supplier of components. This is a gradual process that is just now beginning to be felt.

Increasingly, hardware and software will be sold through third parties, and, for all but the largest customers, relationships with these third parties will become more important than direct relationships with suppliers.

Third parties range from simple distributors to value-added distributors to systems integrators. They will employ a range of expert systems and artificial intelligence tools to assist the user in specifying and configuring complex systems using system components — hardware and software from a variety of suppliers worldwide.

When segments consolidate and noncompatible product lines are abandoned, users must, and will, pay more careful attention to the viability of suppliers with whom they wish to establish long-term relationships. Such viability analyses will become standard in most large organizations and will be conducted on an annual or biannual basis, depending on the importance of the supplier.

In general, the balance of power between users and suppliers is shifting to the user. Knowledgeable customers will have a greater number of suppliers from which to choose. Users' dependence on



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suppliers will decrease as they become more willing to buy from third parties, from new companies and, especially, from international firms.

Branching out

Prior to 1980, information technology was something purchased only from a rather limited number of product and service suppliers. Then communications came to be recognized as part of the information technology industry.

Now there is a growing awareness that many products and services not normally considered part of this industry possess an information technology component that represents a significant part of their value. Also, the manufacturing process for all products has become quite similar, whether the products belong to the core of the high-tech industry or lie outside it.

Consider that machine tools, materials-handling equipment, process control and instrumentation of all types contain an increasing percentage of components and systems that very closely resemble general-purpose computers.

Many people understand the considerable role electronics play in automobiles, but this is also true for a wide range of consumer products from microwave ovens to toys.

Services work in just the same way. When you select a brokerage house, which factor dictates your choice: its knowledge of particular investments or its computer systems capability? Certainly the discount brokerage industry would not exist but for information technology.

The size of many intracompany private networks approach that of common carriers in small countries.

Publishing, insurance, travel, banking, real estate, wholesale distribution, home shopping and package delivery are only a few of the examples in which the benefit from (and, in many cases, direct access to and use of) the service organization's network represents an increasing percentage of the cost and value of the service.

In recognition of this, these suppliers' information services are increasingly likely to be priced separately and managed as separate profit centers.

There are already some early examples of this change.

McKesson Corp., the largest drug wholesaler in the U.S., sells computers, software and services to client drugstores while also selling data from its computers to market analysts. American Airlines is in the business of selling information to travel agents through its Sabre reservation network — and finds profit rates in that area overshadow its original airline business.

WHEN you select a brokerage house, which factor dictates your choice: its knowledge of particular investments or its computer systems capability?

Available options

The range of options for obtaining information capabilities is expanding and now may include the following:

- Using in-house resources based on purchased system components.
- Drawing on clearly defined infrastructure services.
- As is increasingly common, drawing on the company's existing suppliers, which in the past provided a wide range of noninformation-technology products and services.

These suppliers, more commonly considered users of information technology, are now becoming both channels of distribution for and competitors with the traditional information technology suppliers.

Thus we see many user categories — once historically distinct from the information technology industry — becoming suppliers of information technology, both of services and products.

In the process, they become intermediaries between primary

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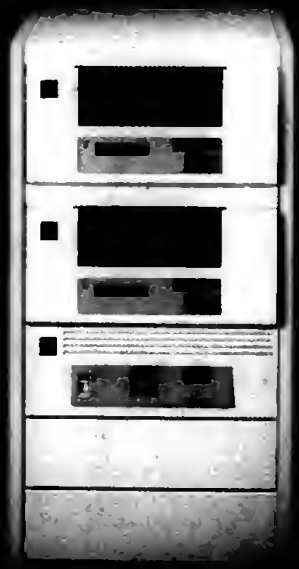

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suppliers and ultimate users.

The merging of these non-information-technology industries into the information industry can be gradual or rapid. We differentiate three stages:

- First, information technology becomes a critical success factor for the company.
- Second, information services become a by-product sold to the same customer base.
- Third, information services are sold to new customers and represent a major source of revenue.

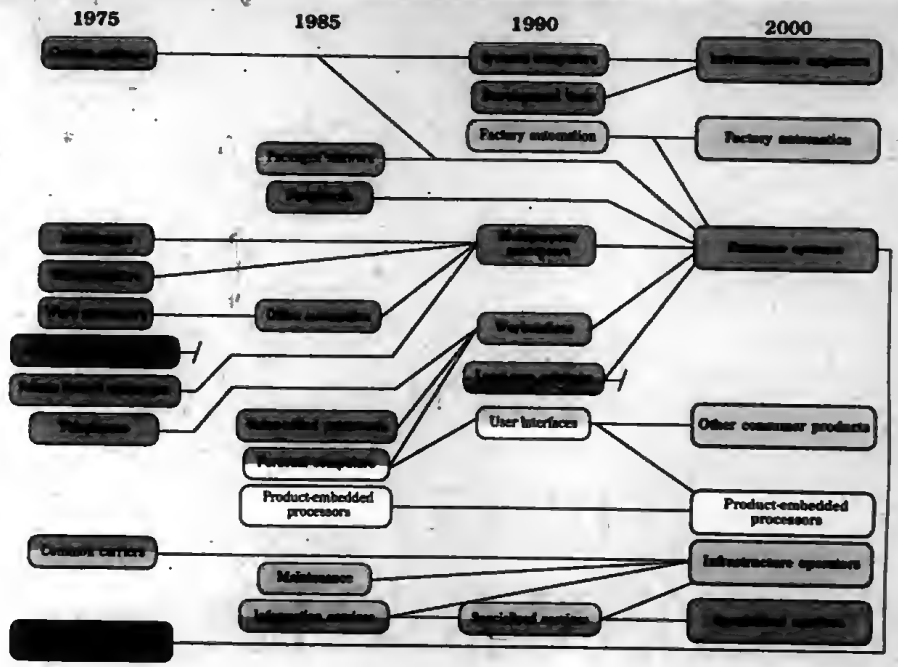
IT IS best to view the migration of user industries into the information technology industry as a gradual process that adds to the scope of their businesses.

A fourth stage, backward integration into the manufacturing of hardware, is also possible for certain companies but in general will not be desirable.

Clearly, many industries are now in stage one. Publishing and financial services are in stage two and are moving into stage three.

The market in 2000

By the year 2000, the information industry will coalesce into seven major segments; each segment can be traced back to its origins in the 1970s



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Overall effects

Although every company moves at its own pace and there are clearly leading-edge companies and followers, it is useful to look at this process as affecting entire industries rather than individual companies.

It is also best to view the migration of user industries into the information technology industry as a gradual process that adds to the scope of their businesses. Banks will still be in the banking industry, but they will also be moving slowly toward the provision of infrastructure services.

User industries will likely be incorporated more and more into the information technology industry. Spurring this is the entrance of new areas of the economy into the infrastructure services segment. Television, or the entertainment and education functions provided by television, will be part of this segment by the year 2000.

The profound transformation of the information technology industry can be depicted graphically (see chart above).

The diagram is our conceptual model of the industry's future, showing the birth, death, subdivision, coalescing and transformation of major industry segments in each decade.

The reasons that industry segments coalesce include the merging of distribution channels and user requirements as well as the narrowing of the differences in product functions, components and manufacturing technology among the various segments.

When we say "industry segment," we mean a group of suppliers with common products, users and competitive conditions.

A segment is the smallest component of the market capable of supporting a group of suppliers. Therefore, when we depict the segment "compatible peripherals" coming to a halt, we do not mean the devices will cease to exist but that peripherals alone are no longer able to support a discrete number of suppliers.

On the chart, the lines connecting segments between time periods show the flow of companies through acquisitions, mergers and alliances, not the flow of products.

Looking at the future

The following are definitions of the seven industry segments anticipated in the year 2000, each with a listing of their primary subsegments:

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industry as we know it today.

Its subsegments include standard hardware components, new and special-purpose hardware components, packaged horizontal-market software and packaged vertical-market software.

Operators of infrastructure services is another segment, distinct from the designers of these services. Infrastructure services are those that are provided by third parties and that facilitate the development of other activities in the economy.

This segment represents common carriers and information-based services converging, as regulatory barriers between these two areas are softening.

Subsegments include basic Integrated Services Digital Network services, data base services, transaction-based services, maintenance, nonlocalized monitoring and control, educational and instructional systems and entertainment.

Designers and builders of infrastructure services is a large, people-intensive segment involving massive projects. The system integrators of today will turn their talents to this segment.

Subsegments include government infrastructure services, private infrastructure services and large, noninfrastructure commercial services.

Specialized knowledge-based services and software is a segment populated primarily by Sector II companies. This group will use the year-2000 version of artificial intelligence to solve highly unstructured problems.

Subsegments of this sector include professional, industry-specific financial arbitrage, other industry-specific decision making, generalized functional area decision support and generalized skill-specific decision support.

Product-embedded systems are currently available products with a microprocessor or collection of microprocessors embedded in them. Examples are cars, buildings, microwave ovens and vacuum cleaners. They will generally continue to be supplied by companies currently outside the information technology industry.

Subsegments of this sector include vehicle-based systems, stand-alone nonmobile and mobile consumer appliances, home and other multiunit control systems and the software aftermarket.

Other consumer products consists of new products based on new technologies and workstations. Rather than automate an existing function, this segment will create new ones. These products may be supplied by existing information technology industry companies or new entrants from the consumer products or consumer electronics areas.

Subsegments identified include body function enhancers, home-based stationary and mobile units, companions or servants and the software aftermarket.

The factory automation segment has developed from three sources: mechanical engineering; sensors and controls; and computers and software. Companies in the factory automation segment provide products and services other than general-purpose computers for discrete, hybrid and continuous manufacturing and process control.

The required central coordination and specialized nature of this application suggest that this segment will remain distinct through 2000, but individual products as they mature may move to the business systems components segments.

Subsegments include standard components, specialized components, packaged software, freestanding automation units, integrated automation equipment, factory systems designers and integrators and, lastly, basic services for factory and commercial building.

VENDORS will need to pay careful attention to the emerging dual-market structure and diverse requirements for success in each sector.

Structure for the future

In both user and vendor organizations, information officers need to know that their long-range plans and investment decisions are consistent with the evolving structure of the industry. We believe our conceptual model provides such a framework.

Vendors will need to pay careful attention to the emerging dual-market structure and diverse requirements for success in each sector.

Also, vendors will begin turning more often to strategic alliances as a way of coping with bifurcation of the market. But along with opportunities, such alliances will also pose risks.

User organizations will find their changing role opens fertile ground for competitive repositioning. With users acting more often as suppliers, their competitive strategy will be inseparable from the quality of their information capabilities.

In addition, consolidated industry segments and abandoned product lines present potential pitfalls for users. Information executives must pay more careful attention to the viability of suppliers with whom they wish to establish long-term relationships.

Viability analysis will become standard as large user organizations try to ride out the upheavals in the structure of the industry. ●

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Surprise control

If end users are taken aback by what they see on the screen, something slipped through the cracks in testing

BY MAC PATRICK

Are surprises a bad thing? Ask the commercial pilot who depends on a navigational computer to stay on course or the jet pilot whose controls are software driven or the sales manager who relies on spreadsheet models for planning a product introduction. Nobody wants to be surprised by software that misroutes a phone call or a paycheck.

Getting a product out the door seldom suffices. Sometimes it falls right back in, if there wasn't enough attention paid to keeping development on track. Appropriate testing is what prevents the surprises that can otherwise happen when the end user gets the product.

That sounds simple enough. Yet, confusion continues to obscure the value that appropriate testing adds to projects, and we continue to be surprised by product failures.

In our haste to bring projects to completion, we disregard the "beginning-middle-end" product development life cycle that is used in many industries to develop products.

Patrick is a consultant at Pacific Bell in San Ramon, Calif., advising on software development and maintenance environment assessment and implementation issues.

The other half

The life cycle of a product — whether it is a data base application or a switching system — helps developers keep their bearings, shows how different intermediate products relate and lets us know how close we are to being finished.

Knowing what you're doing includes knowing how you're doing: That's what testing is for. Development is half the job; testing for reliability and trustworthiness — and looking for surprises — is the other half.

Before we can examine the different kinds of testing, we need to agree on some common points of reference in the development life cycle. The traditional "waterfall" life cycle is a convenient abstraction for illustrating the sequence and overlapping of activities during a development project (see chart page 95). But it is too ad hoc to serve as more than a general illustration and far too simple to use to help in discussing intermediate deliverables usefully. It also leaves out end users and their role in testing.

Keep in mind that the end user is at the beginning and end of any development process. The role of the end user has been aptly illustrated by software quality assurance expert Elemer Magaziner (see chart page 95).

Magaziner's diagram also highlights how to map the development stages to their corresponding testing stages. It further makes clear why it is so beneficial to develop test plans in parallel with corresponding development products.

Development loop

But in some instances, Magaziner's diagram is the wrong abstraction, since it depicts each stage of the life cycle separately. For the purposes of this article, look at the modified life cycle diagram (see chart page 96) that shows the development loop. This model is easy to remember and yet provides enough detail to allow developers to unambiguously map complicated projects onto it.

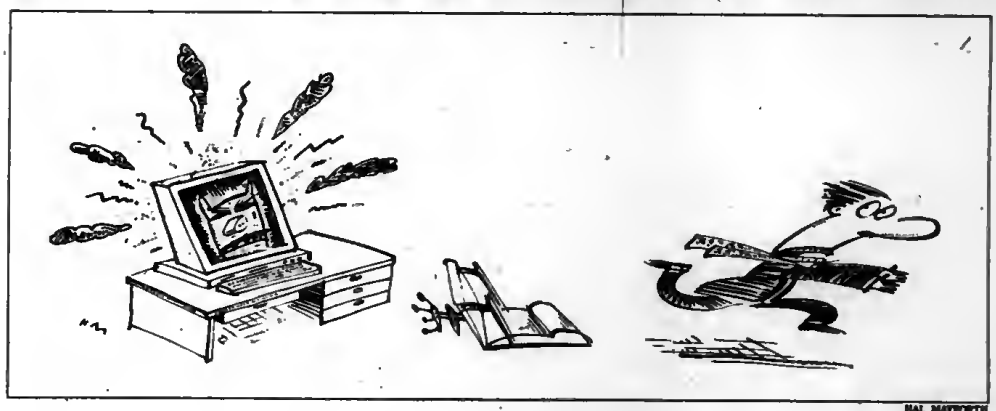
To start the loop, we build models to show to prospective end users. Then we use those models — very abstract at first — to build design models, increasing the concreteness of our models until code can be produced. Each step ahead is based on the feedback received: the test results. Models are passed between builders and users over and over, as many times as necessary.

This illustration is intended to depict a realistic life cycle: the loop of model to user, test results to builder. This testing process will continue until the end user sees the system he needs in the model — and eventually in the product.

The following rules of thumb need to be kept in mind:

- The end user is the only one who can say that a model is the right model.
- The builder is responsible for building the model based on the end user's requirements definition.
- Any kind of model is fine (prototyping using screen painters, paper storyboards and so on) as long as it provides enough clear information to allow it to be tested and to develop the products that are needed to move into subsequent software design stages.

Showing end users a model in the usual sense is not sufficient. To be useful for development, a



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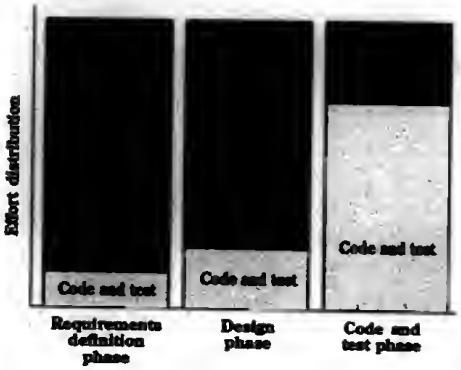
Traditional "waterfall" life cycle

All development activities take place during each stage of the life cycle, but the amount of effort varies



model has to include operating instructions in the form of a test plan.

A model can be flashy and exciting, but before an end user can determine its adequacy and completeness, he must have some way of exercising it to discover its characteristics and limits — and any surprises. This is what testing can accomplish.

Levels of testing

There are four levels of product or program testing: acceptance testing, system testing, integration testing and unit testing.

The most important level — acceptance testing — answers the end user's question, "Is this what I asked for?"

The acceptance test plan represents the end users' criteria for acceptability. Only by executing the acceptance test plan will the end users know whether the product they received meets their needs or contains unacceptable surprises.

Incredibly, there seem to be some end users who don't want to know. There is no other explanation for why some software packages developed under contract have been paid for despite horrible surprises that are apparent even to the most casual user.

Acceptance testing also reveals how well end users communicate to builders what they want. This type of testing may be based on a request for proposal (RFP) process or it may be less formally based on whatever purchasing approval process an organization uses.

Writing the RFP and the acceptance test plan concurrently not only strengthens the RFP, but it also allows the user to estimate and plan ahead for the time and resources that will be required for performing acceptance testing after product installation.

If the builders can see both the description of the user's problem and the description of how the product under development is to be tested, their first models will be more accurate.

For example, defining the test cases needed to determine whether data base accesses are possible or fast enough may reveal timing or sequencing problems that affect the requirements for the application.

Finding a defect and fixing it during the early stages of the development process is several times cheaper — some sources report a tenfold increase in cost for finding and fixing a defect in successive stages of the life cycle — than the cost of finding and fixing defects while actually performing the testing.

Any action that moves the detection and correction of defects toward the beginning of the project will result in decreased costs for the project.

The first time I saw this idea in practice, the acceptance test plan tipped us off to the users' need to merge names and addresses from a data base with documents created using several different word processors.

Our interviews with the users hadn't discovered that requirement; their test plan revealed it. The idea is to reduce the number of iterations for the requirements definition model and make it more complete and understandable.

System testing

The requirements definition states what the system is supposed to do; system testing determines if it does it.

The builder constructs a model (or takes one off the shelf) to show the end user, and alongside it he writes a corresponding system test plan. While the end users test the model using their acceptance test plan, the designer needs to see the system test plan to know how the component designs he will be building will be assembled and tested and how the components will behave in the aggregate.

The product's designers are users of the requirements specification and the system test plan, just as the product's users are users of the requirements specification and their own acceptance test plan.

Builders should think of system testing as the "high-leverage" level of testing. If the code works and the pieces fit together at the end of the project, then the remaining question is, "Does this program/system do what the user wants it to do?"

The system test is the developer's last chance to identify and eliminate any surprises before the user gets the program.

System testing is not solely a matter of exercising the system with real data to check for aborts; nor is it just an opportunity to exercise the hardware, data bases and communications software that implement the application.

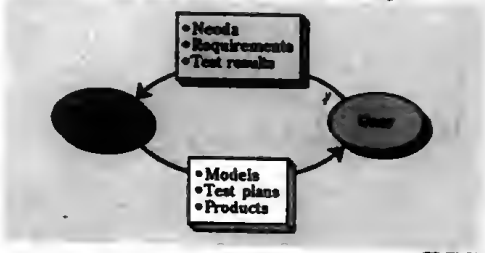
System testing, like all of the testing described here, means being able to verify that predicted actions take place when known conditions are caused for the application and being able to detect any discrepancies.

I've seen complex and expensive installations for exercising software demonstrated by managers who thought a volume test with live data in their test environments would accomplish system-level testing, too.

Some banks have been unpleasantly surprised later to find out from their auditors about undocumented functions in their software that were undetected

A realistic life cycle

The simplest life cycle is a loop — model to user, test results to builder — with iterations until the system is "good enough"



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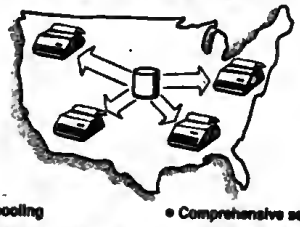

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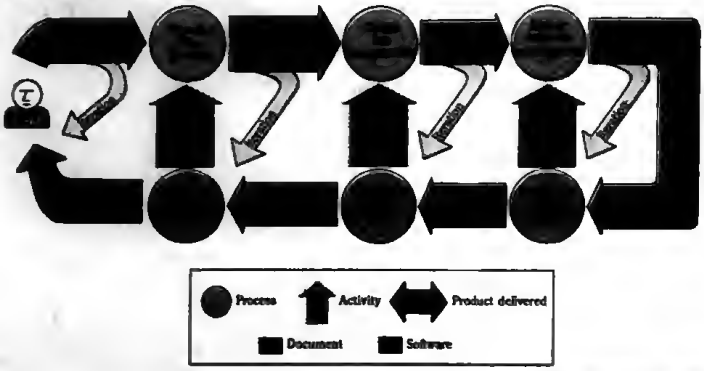
End user's role in testing

Mapping development phases against corresponding test phases dramatizes how the end user is at both ends of the development process



CW CHART: AMY J. SWANSON

by testing in that way.

System test plans are developed while the requirements definition model is being built. When the system test plan is developed in parallel with the requirements definition, one result is that the requirements definition will describe a "testable" system.

Also, the requirements definition will be more complete after being challenged by the "What would happen if this were tested?" questions that testers ask when building system test plans. The amount of effort needed to perform system testing will be predictable once the test plan is built. Providing the designers with both the system test plan and the requirements definition enables them to develop a better designed product.

The system test plan shows how the builder intends to demonstrate that be captured the end user's needs correctly in the requirements definition. Mistakes or shortcomings in building the requirements definition or the system test plan cause surprises that typically show up as failures in the product, as necessary misuse of the product or as a continuing need to develop major enhancements for the product after delivery.

Fixing defects found while performing a system test requires trekking back through the whole life cycle of the project. The requirements definition and system test plan must be analyzed and corrected, the design and the integration test brought up to date and the code changed. Then the product must be unit tested, integration tested and system tested again.

In our company, we have a few examples of project managers who had the courage to accept a product delay and go back to a redesign or reanalysis based on the nature or the quantity of defects found in system test. They were considered successes by their end users, although the budget estimates suffered.

For the builder, it is far better to find defects in system testing than for the user to be surprised by defects found during the users' acceptance test. On one recent project, the surprises found by the end user in acceptance testing led to rejection of the product. The vendor has offered to redevelop the product and has changed its system testing practices. There must be an easier way.

Integration testing

When the requirements definition model and its system test plan are judged complete — that is, the user agrees that the model of the system accurately describes the solution of their problem — design begins.

Designers have to be concerned that the requirements described in the requirements definition model are entirely embodied in the design, and that the design they are describing is buildable. Describing the data required and partitioning the functions necessary to maintain the data according to the requirements makes design an exercise in defining the piece-parts.

The parts can be tested by assembling them in various combinations and verifying that they work together in accordance with the requirements definition. That is called integration testing.

"Does it fit?" is the question integration testing answers. This question has the following two components:

- Is the flow of control from component to component complete and correct?
- Is the data being passed from component to component correct?

In recent years, some tools have become available to support integration testing. "Coverage" analyzers that chart which pieces of code have been tested by which test cases can provide a picture of control flow among the modules of a program. "Make" programs that control the assembly of a complex program from many component programs (in the sense of configuration management) simplify the integration testing process.

Often, design will call for instrumentation at key intrasystem interfaces to allow data to be input or captured for testing purposes. For integration testing, the details of what each component is supposed to do are less important than the information about the design of how components must operate together in terms that can be observed. Integration testing, therefore, is based on whether the components share control and data as specified in the design.

At the integration level of testing, valuable information about the overall quality of the system or program can be collected and analyzed. As Glenford Myers pointed out in *The Art of Software Testing*, a very small percentage of the modules in any product account for a large percentage of the defects.

This affirms the Pareto analysis, based on the work done by the 1920's Italian economist Vilfredo Pareto, which proves experientially that less than 20% of the modules in a given system will account for more than 80% of the defects found. Then there are the results from "defect seeding" research into the effectiveness of defect discovery, which found that only half the errors existing in a given volume of code will ever be discovered.

Together, these two ideas make a strong case for both tracking defect rates at the module level and actively redesigning components that have high error rates.

MISTAKES or shortcomings in building the requirements definition or the system test plan cause surprises that typically show up as failures in the product.

Problems discovered in integration testing require reassessment of whether the design or the integration test was at fault, the repair of the design or the integration test plan and then recoding, re-unit testing and re-execution of the integration tests.

When the design appears to completely support all of the requirements definition and is buildable according to the people who will produce the code, and design models are detailed enough to permit the generation or writing of code, unit testing can begin.

Unit testing

Unit test plans are developed, of course, while programs are being written or generated. The easiest kind of testing, unit testing answers the question, "Did I code it right?"

The object of unit testing is to use information from the design and the integration test plans to build unit test plans and test cases that exercise the

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components being built so as to reveal any defects.

The builders of the code benefit from having someone work with them on their products, but to a different end; the test plan builders benefit from having the developers handy to review their testing products for correctness. Each influences the other in a way that drives toward understanding the design more clearly and verifying that the code is complete, correct and contains no surprises.

Tools and techniques are available to support this kind of testing, ranging from interactive debuggers to syntax checkers. One is the Cleanroom approach to unit and integration testing, described in "Cleanroom Software Development; an Empirical Evaluation," by R. W. Shelby, V. R. Basili and F. T. Baker (University of Maryland Technical Report, February 1985).

In this method, development standards such as code reading, peer reviews and other techniques are employed to reduce or eliminate the actual machine execution of testing. These techniques have been shown to be as or more effective than traditional testing.

The nature of unit testing, in which you see if the code runs, and integration testing, in which you see if the pieces hold together, has changed for some projects because of technologic advances such as code generators, fourth-generation languages and object-oriented programming. When the need remains to test at these levels, the Cleanroom approach is superior to exhaustive interactive testing efforts for achieving high-fidelity products — products that remain faithful to the users requirements.

Valuable shortcut

The Cleanroom approach is predicated on understanding and using the concepts outlined above. Cleanroom testing is particularly valuable because it explicitly moves the verification steps up in the life cycle, so that they happen as each building stage ends. By committing to this, a project team can forgo exhaustive testing at each level and instead use statistics-based system testing only. The quality of the products seems to benefit from this, as does the productivity of the project team.

For many programmers, the compiler or interpreter guides unit testing: When the error messages have reached an acceptably low level, they consider the unit testing done. More experienced colleagues know it is vital to process test data to see if the code does what it was intended to do.

One of the more famous software defects in recent years — it cost its company more than $30 million in lost revenue — was caused by an enhancement to a timing routine that was never unit, system or integration tested. In the end, the problem was reported to be a classic error in changing the algorithm — a coding error. Unit testing would have discovered the surprise.

The execution of the unit test begins after the code and the corresponding unit

Keep developers, testers separate

It is usually a mistake to put the cat in charge of the canary, or the project manager in charge of quality assurance. People just are not good at finding fault with their own brainchildren.

The reasons for separating the testing and development functions are obvious: Testers have different goals than developers. Testers try to find defects; developers like to demonstrate how the product works.

Despite recognition of the inherent conflict of interest involved when the developer is the tester, that is still the way many projects are organized. Sometimes it seems as though being allowed to test is considered a reward for builders, giving them a chance to play with and exercise the system they developed.

Clearly, a builder will not exercise a system in a way that will reveal defects. He knows how the system is supposed to work and will — even unconsciously — remain within those bounds. A tester has no such ego investment to protect and can exercise a system in the ways an end user might. Neither caring about nor blinded by what it is supposed to do, a tester can see what the system or program actually does.

While some organizations treat testing as a less skilled position than development, in our company, testing is recognized as requiring a high degree of technical expertise and experience.

Job expertise about applications, application development and the operating environments they run in limits the pool of qualified people that would be the best technicians.

How much an organization values and benefits from separate testing can be seen by looking at who is doing the testing. A recommendation made by a respected, experienced technical professional who says a product has too many defects and must be fixed and retested before it ships is more likely to be followed than the same advice given by an entry-level technician.

The people who do the testing have ultimate control of what is delivered to the end users. They need to wield commensurate qualifications, and they need to be supported by the organization so they can resist pressures to "go along" and can instead report on the real quality of the product.

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test plans are built. The kinds of defects that are discovered in unit testing should be fixable in the code.

Taking action

Test plans are developed top-down, beginning with the acceptance test plan and continuing in parallel with the development of each level of the model until the unit complete. Testing is executed bottom-up, beginning when code for parts of the system is available and proceeding until the user has accepted the entire, assembled system.

In real projects it is sometimes possible to dispense with some levels of testing, for example, because of the use of a fourth-generation language or the skills of the people involved.

But acceptance testing and system testing must always be accomplished. Unit, and to a lesser degree integration, testing may be reduced or bypassed depending on technical or skills capabilities.

Finding out if the system does what the developer expected it to do and whether the user agrees that it meets his expectations is never optional. Failure to system test or acceptance test denotes de facto project failure — the surprise level will prove to be unacceptable.

Who's using who

Because the process of development is spurred by an end user's needs, the criteria defining what will fulfill those needs has to be captured. A deliverable product and a description of how the quality of the deliverable product will be determined are necessary to describe those needs.

The requirements definition writers and the system testers are the RFP's users; the designers and the integration testers are the requirements definition's users; the coders and the unit testers are the users of the design. And so it goes, putting opportunities to detect and correct mistakes as early in the process as possible. Surprises should be ironed out before testing actually takes place.

Testing, considered by some to be exhaustive and time-consuming, ensures that each successive product conforms to its requirements as specified in the preceding stage of the process. In this way, when a product goes out the door, it stays out. •

Testing for quality assurance

There seems to be, maybe as the result of wishful thinking, the idea that if you are developing an artificial intelligence application or using a fourth-generation language for development, your life cycle doesn't need to include testing. Instead, some form of prototyping is often prescribed for verifying that the system meets the end user's needs.

In practice, using a prototype as a means of testing moves the end user into the realm of "discovery development." This is where the end user doesn't know what he wants, but believes he'll know it when he sees it.

There are times when this approach is necessary. However, we must accept that there is a high risk that the end user will not see what he needs or that he will settle for a partial, nonoptimal solution.

For most business systems development, the assumption is that the problem has been stated before system development began. That is true whether the solution is perceived to be an expert system, a traditional batch system or a fourth-generation language application. When the purpose is to develop a system to solve a problem, testing is the means to determine whether the system really solves the problem. The form that testing takes may be different for applications using these technologies, but the goal is the same.

While the need for unit- and integration-level testing may be reduced or eliminated by these techniques, the need for system testing on the part of the developer and the need for acceptance testing on the part of the end user remain.

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MANAGEMENT

TAKING CHARGE

Raymond L. Newkirk

Humanizing management

After participating in numerous information systems consulting jobs throughout the world, one fact stands out to me: most MIS managers get to be MIS managers by default. Whether you're working in Europe, the Middle East, Australia, the U.S. or Southeast Asia, the pattern is the same.

Many individuals gain a promotion to MIS manager as the result of superior technical performance that has little to do with the specialized discipline of management.

Over the years, experience has taught us that the problems most often encountered in an organization in which the MIS manager was formally a technician are those termed "people problems."

These problems arise from such factors as a lack of employee motivation and direction, a low level of employee participation in critical projects and insufficient professional development and training.

Obviously, a whole new world awaits the technician embarking on a fresh career in MIS management. The former technician must now understand that the meaning of his job has suddenly changed. He must realize that management means getting others to do their jobs — motivating others to get the job done.

The following actions, reflecting some of the most critical needs in most MIS organizations, are drawn from principles

Continued on page 102

Toyota amalgamates best of both worlds

Robert A. Best, vice-president of planning, systems and business development for Toyota Motor Sales U.S.A., Inc. in Torrance, Calif., delivered the keynote address at the annual conference of the Data Processing Management Association earlier this month. He shared his experiences in employing a management style that he describes as a hybrid, incorporating elements of both Japanese and American practices.

Robert A. Best

Best says the approach reflects Americans' entrepreneurial drive for individual accomplishment and financial gain and the very different Japanese objectives of generating consensus and team achievement.

Computerworld Senior Editor David Ludlum spoke to Best recently about his experiences.

To what extent is your department influenced by Japanese management concepts?

Well, to a significant extent. We have a very limited, tiered organizational structure, with three levels. The obvious advantage of that is that communication only goes down to two people, and it gets to everybody.

Another [Japanese practice] we've emulated is elimination of grades and titles, which I think goes a long way in making everybody feel they're an equal member of the team. We call them members of the professional staff and members of the management staff. I think because of that, we eliminated a lot of the traditional American stigma on precise titles and getting promoted based on job descriptions. What we try to do is pay for professional services rendered.

What other Japanese concepts do you use?

Another thing that we have is a consensus management style. We agree with our peers on each major program we plan to implement, rather than strictly directing from the top.

We make sure everybody in the organization who is affected by that project is aboard, so that everybody will support the project and it becomes the company project, not an individual's project.

We also practice what I'll call a strict nonadversarial management style. We're all here to do our own function but also to help others to do theirs. We want each other person to be just as successful as we are.

Another one of the things we've learned from them is how to communicate quickly and directly, and the secret of that is oral communication. The Japanese style is if you've got a problem, you call somebody right now and go work it [out] directly.

What Japanese management concepts have had the greatest impact on your department?

I think the nonadversarial approach and management by consensus are the two major strengths.

Continued on page 102

Going beyond MIS

Ashton-Tate executive seeks broader role

BY JAMES A. MARTIN
CW STAFF

TORRANCE, Calif. — Contrary to popular belief, there is life after MIS.

After a 20-year career, Richard Di Giovanni is moving away from the computer room and toward the executive suite.

Di Giovanni, 42, has served as Ashton-Tate Corp.'s vice-president of MIS since 1985. Now he is relinquishing that title for a new one — vice-president and general manager of Ashton-Tate's systems, service and information division.

Di Giovanni, who fell into an MIS career inadvertently but quickly rose through the ranks, stresses the importance of developing a wide range of skills within the corporate environment. Recently, Di Giovanni says, his goal has been "to get out of MIS" and move into another area, such as marketing or sales support.

'Already proved myself'

He confides that he has had offers to leave Ashton-Tate to pursue what he does best — develop MIS strategies for film corporations. But despite the lucrative nature of these offers, he has declined. "I've already proved myself in that area," he says. "To go back and do that kind of thing again would be to repeat myself."

Di Giovanni's aggressive approach to his career is reflected in his management style, according to colleagues.

William Hausch, executive director of Columbia Pictures Industries, Inc.'s Filmed Entertainment Systems in Burbank, Calif., and a former co-worker, says Di Giovanni acted as a buffer between his staff and upper management, working through corporate red tape to get things done.

"He has a hands-on management style. He is concerned about day-to-day affairs. When things get tough, he is on the phone, working through it," Hausch says.

Picture this

Omer Simeon, a copartner in the Los Angeles consulting firm HTM Co., also worked with Di Giovanni at Columbia Pictures. "When we were at Columbia, Rich had to take them from not having any automated systems of their own to having a full covenant of systems, and he did it within a year," Simeon recalls.

Di Giovanni handled the situation with his "straightforward, aggressive" style, Simeon says. "He meets his commitments and gets the user what he needs."

Continued on page 104

PROFILE

Richard Di Giovanni

BRETT FROOMER

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BOOK REVIEWS

Piecing together supercomputers' emergence

BY BRETT BERLIN
SPECIAL TO CW

The Supercomputer Era
By Sid Karin and Norris Parker Smith
In June 1983, while describing the implications of Cray Research, Inc.'s success to a Congressional Science and Technology Committee, John Carlson, Cray's executive vice-president, made a startling observation.

"The world is on the verge of a major computing revolution as supercomputing is applied across a broad industrial and scientific base. The only question at this juncture is which nation will choose to lead that revolution," Carlson said.

This "revolution" is the subject of *The Supercomputer Era*, a book that almost deserves publication for its prescient and provocative title alone.

This is not just another catchy phrase that describes a skin-deep fad; what Karin and Smith are saying is that something is happening that may be a candidate for inclusion in an updated editon of John Naisbitt's *Megatrends*.

Unfortunately, the authors fall short in their efforts to move from a description of some of the events that are putting supercomputing on the map to the sort of broad analysis that establishes something as heavy and historical as an "era."

This is not to say that the book is uninteresting or that the facts in it are insignificant. Quite the contrary; it should be mandatory reading for technology-driven executives, research strategists, politicians and others who seek a competitive edge for America.

One problem with the book, however, is that the very perspectives that give Karin and Smith credibility and freshness also tie their hands. Both authors operate at focal points of two of the most extensive and best-run supercomputer networks in the U.S.

Karin, the book's dominant idea man, is the creator and manager of the San Diego Supercomputer Center (SDSC). In a sense, this book is the story of how the SDSC came to be and of the exciting things that are happening there.

This leads to some oddities in its structure. The second chapter, "Anatomy of a Supercomputer Center," for example, is primarily a description of the SDSC with some comparative references to other centers.

In a book whose stated intent is to introduce a substantial technological trend, such a chapter seems more appropriate as an appendix and is clearly out of place so early in *The Supercomputer Era*.

Likewise, chapter six, "Today's Revolution: The Expansion of Supercomputer Availability," is really an index of North American university research facilities tied into an academic supercomputer network.

Surprisingly, the authors do not even include in this chapter the many supercomputers available to researchers outside of North America, despite the fact that in many cases, the overseas systems were at the leading edge of the worldwide trends the book tries to address.

Another weakness is the book's treatment of policy, political issues and history as they relate to supercomputing, including export control, the Strategic Defense Initiative and events leading up to the funding of the National Science Foundation (NSF) centers.

For example, the authors suggest that the supercomputer era formally "left port" when the NSF spent money and established the centers, providing much broader access.

However, the actual appropriation of funds came relatively late — after the rest of the world and several key industries had already made major commitments to the fundamental and exciting changes that this era is helping to bring about. This is not a major problem, however; indeed, these issues might be an excellent topic for a sequel to *The Supercomputer Era*.

Berlin is a former vice-president of Cray Research, Inc. and president of Brett Berlin Associates, a consulting firm specializing in high-speed computing technology and business strategy.

BOOKS IN BRIEF

VM/CMS Handbook
By Howard Fosdick
A resource for tapping the power of VM that is written for programmers, software engineers, analysts and installation managers.

Softcover, $32.95, 404 pages, ISBN 0-672-46790-9, by Hayden Books, Indianapolis, Ind.

Building an Open System
By Jacob Slonim et al
Attaining the "open systems ideal" with a comprehensive look at hardware and software, not simply communications issues.

Hardcover, $39.95, 299 pages, ISBN 0-442-28068-8, by Van Nostrand Reinhold Co., New York, N.Y.

Ventura Tips and Tricks
By Ted Nace
Using the Xerox Ventura Publisher, including tutorials for beginners and practical advice for advanced users on speeding up the program and overcoming memory limitations.

Softcover, $15.95, 288 pages, ISBN 0-938151-01-0, by Peachpit Press, Berkeley, Calif.

Handbook of Computer-Communications Standards
By William Stallings
The first of three volumes exploring standards, this one focuses on the Open Systems Interconnect model.

Hardcover, $34.95, 322 pages, ISBN 0-02-948071-X, by Macmillan Publishing Co., New York, N.Y.

Publishers wishing to have their books considered for review can direct books, prepublication galleys, press releases, catalogs or other information to George Harrar, Book Review Editor,* Computerworld, *P.O. Box 9171, 375 Cochituate Road, Framingham, Mass. 01701.

Toyota

FROM PAGE 101

To what extent can Japanese management principles be applied here?
The ones I've touched on — teamwork, the nonadversary style, management by consensus, excellent communication.

You also mentioned the principle of acquiring generalized experience to the extent it's practical. Is that prompted by the Japanese?
Yes. They do that a lot more than we do. We do try to move people between [functional] organizations. We believe that's essential to get well-rounded people who can discuss an issue from several points of view, rather than from the traditional, parochial, single background that the American person might more frequently have.

Can you identify some of the American principles that are part of your management style?
One is creativity. I think [Americans] are more aggressive and entrepreneurial in their thinking; they're willing to discuss new ideas and new concepts, whereas the Japanese would have a tendency to be more conservative.

We also bring an ability to look into the future. While the Japanese are extemely good planners, I think one of the skills Americans have is an ability to sense the future on intuition. I think that goes back to our entrepreneurial background and the desire of most Americans not to stay in the status quo — to keep looking into the future.

You said you don't take work home with you. Do you think it's counterproductive to be taking work home?
I qualified that as a personal note, as opposed to what our whole corporation does. I believe in husbanding your time at the office to where you make every minute absolutely count. I have just found that if you discipline yourself — by making phone calls short, by calling direct, [having] short meetings, few meetings, a small amount of correspondence — you get rid of all the things that occupy a lot of your time.

One of the problems with a lot of American managers is they don't delegate a lot of the things that come in. It goes back to the cardinal rule of delegation. The fact that I can delegate it all out means that my time is free to communicate with my peers, to monitor the performance of my organization — that I do the things that are the true requirements of a manager, not busy work.

Humanizing

FROM PAGE 101

of human behavior that are most often violated by managers attempting to carry out the corporate mandate. Some of these MIS management objectives are:

- Enhance communication laterally, vertically and diagonally.
- Boost management's dedication to facing organizational problems, both within and among groups.
- Create an environment in which authority by position, or assigned role, is strengthened by authority based on knowledge, skills and expertise.
- Find more synergistic solutions through which all parties involved in a problem gain through cooperation.

The human equation
Working as an MIS manager today and attempting to implement the above objectives forces the manager to consider the human equation with three distinct points of view: people as individuals, in groups and within the organization.

As to what we have learned about people as individuals, two important principles stand out.

One is that most people have drives toward personal growth and development that are better actualized in an environment that is supportive and challenging. The other is that most people want to contribute more to fulfilling an organization's goals than many organizations will permit.

When we look at individuals in groups, other principles stand out. One is that most people want to be accepted and interact cooperatively in at least one small reference group, such as the work group or family.

Another is that most people can increase the effectiveness of their reference groups by helping solve problems and contributing to the group's ability to work together effectively.

When we extrapolate from these principles, we have some grounds for understanding the behavior of people in an organization. One principle here is that organizations are characterized by work groups that overlap and remain interdependent.

Another is that most organizational cultures inhibit the expression of feelings people have about each other and in which direction they and the organization are heading. This adversely impacts problem solving, personal growth and job satisfaction and diminishes trust, support and cooperation.

Research conducted at Texas Instruments suggests that some MIS production activities that appear inherently mechanistic may need a more participative, open management style than is frequently assumed possible. This research corresponds with those human behavior principles just summarized.

Today's MIS manager must learn to rely on a humanistically oriented methodology when carrying out the mandate of the corporate offices. Since not all managers are capable of employing such a method, extreme care should be exercised when appointing people to management positions within a humanistic environment. The qualities such a manager should possess are as follows:

- A strong ego that will not be overwhelmed by organizational conflicts.
- Psychological defenses low enough to allow the manager to hear relevant criticisms.
- The ability to communicate thoughts and feelings with minimal distortion.

Through the careful application of sound, humanistically oriented management principles, today's MIS managers will be doing their part to ensure that the warning of columnist Sydney J. Harris remains only that — a warning. "The real danger," Harris says, "is not that computers will begin to think like men, but that men will begin to think like computers."

Newkirk is a management consultant based in Santa Clara, Calif. This column was adapted from an article published in the "Journal of The Phillipine Computer Society."

FJCC pushes to fill education void

Organizers, Hooper urge melding of technology, business

BY JAMES CONNOLLY
CW STAFF

DALLAS — The question of educating nontechnicians in technical areas and teaching technicians about areas such as marketing will be before the Association for Computing Machinery (ACM) and the Computer Society of IEEE as they decide the course of the Fall Joint Computer Conference (FJCC).

This year's conference, held here last month, attracted only about 1,250 attendees. However, organizers said that figure matched their expectations, adding that the type of attendee and the quality of the educational sessions made the meeting a success.

"Basically, we met our goals, at least the ones that we imposed on ourselves. We knew there was going to be sparse audience participation. But what we wanted was for those people to go back to their management and say, 'Hey, next year let's send our comptroller and a few other people,' " conference Chairman Stephen Szygenda said.

Filling the void

Szygenda added that the goal of this year's conference was to fill what he called a void in the educational offerings.

Falling into that void, for example, is the need to expose middle-level technical managers in vendor and user companies to issues in areas such as the marketing, finance and legal worlds, Szygenda said.

He cited the cases of FJCC seminars on commercialization of technology and legal issues raised by advances in computer technology. He noted that many researchers, particularly in educational institutions, need guidance in bringing the results of their research to market.

For nontechnical workers, such as those in marketing, the FJCC offered sessions designed to help people understand the technology with which they deal.

Szygenda said he will recommend to the ACM and Computer Society of the IEEE that they continue the FJCC with an emphasis on educating attendees about issues on the periphery of their jobs.

"If we don't pursue this theme, which nobody else is doing, then let's not have a conference," Szygenda said.

The 1988 conference is scheduled for Orlando, Fla.

One of the keynote speakers at the conference, American Airlines Senior Vice-President Max D. Hopper, urged attendees to do their part to apply technology in their business strategies.

"Too many businesses and organizations have resisted applying technology in strategic ways to enhance the viability of their enterprises and, instead, have looked only at narrow applications within a department or a small segment of operation," Hopper said.

Not enough change

He noted that since *Time* magazine named the computer its Man of the Year five years ago, "too many things have stayed the same."

He cited the example of the manufacturing field, in which productivity gains during the 1980s have averaged 3.5%, with most of the gains coming from closing inefficient factories. Hopper said technology has been applied to some assembly lines but that the basic concept of an assembly line in a traditional factory has not changed in 30 years.

Hopper said the information-based organization of the 1990s will require individuals who can merge technology with business strategy, first as a systems integrator and then as a manager who can get support from upper management.

However, for U.S. companies to grow as they must in the 1990s, they will need more technically skilled employees, which will be difficult to achieve when much of the American work force cannot follow written instructions, he said. In the face of that type of problem, the U.S. faces still greater competitive threats from Japan and other nations.

"As computer professionals, we must seize this opportunity and shoulder the responsibility to strike out in bold, new directions. We can't isolate ourselves — or our profession — from what is happening in U.S. business and education," Hopper said.

CALENDAR

NOV. 22-28

Forth Modification Laboratory Conference. Pacific Grove, Calif., Nov. 27-29 — Contact: Forth Interest Group, P.O. Box 8231, San Jose, Calif. 95155.

NOV. 29-DEC. 5

Optical Information Systems Conference and Exposition. New York, Dec. 1-3 — Contact: Meckler Corp., 11 Ferry Lane W., Westport, Conn. 06880.

1987 Interagency Data Center Directors' Conference. Fort Collins, Colo., Dec. 1-3 — Contact: Council of Federal Data Center Directors, c/o Fort Collins Computer Center, 3825 E. Mulberry St., Fort Collins, Colo. 80524.

The Desktop Publishing Conference. Arlington, Va., Dec. 1-3 — Contact: JLS Group, 7485 Demille Court, Annadale, Va. 22003.

1987 Retail Delivery Systems Conference. New Orleans, Dec. 1-4 — Contact: Bank Administration Institute, 60 Gould Center, Rolling Meadows, Ill. 60008.

1987 Cause National Conference. Tarpon Springs, Fla., Dec. 1-4 : Contact: Cause, 737 Twenty-Ninth St., Boulder, Colo. 80303.

Third SIAM Conference on Parallel Processing for Scientific Computing. Los Angeles, Dec. 1-4 — Contact: Society for Industrial and Applied Mathematics, Suite 1400, 117 S. 17th St., Philadelphia, Pa. 19103.

Artificial Intelligence for Financial Services Industries. Washington, D.C., Dec. 2-4 — Contact: Inter-Financial Association, 21 Tamal Vista Blvd., Corte Madera, Calif. 94925.

NATA'87-UNICOM I. Dallas, Dec. 2-4 — Contact: North American Telecommunications Association, 2000 M St. N.W., Washington, D.C. 20036.

Quality Assurance Managers Symposium. Orlando, Fla., Dec. 2-4 — Contact: Quality Assurance Institute, 9222 Bay Point Drive, Orlando, Fla. 32819.

Information Resources Management Standards for Future Information Services. Gaithersburg, Md., Dec. 3 — Contact: Shirley Radack, 8151 Technology Building, National Bureau of Standards, Gaithersburg, Md. 20899.

DEC. 6-12

3th Annual Symposium on Information Transfer. College Station, Texas, Dec. 6-7. Contact: Information Transfer Symposium, Engineering Technology Dept., Texas A&M University, College Station, Texas 77843.

Sixth Annual Executive Conference. Phoenix, Dec. 6-9 — Contact: The Dockey Group, Suite 109, 50 9th Ave. S., Hopkins, Minn. 55343.

Microcomputer Conference. Chicago, Dec. 7-11 — Contact: Marilyn Helfers, Vice-President, Communications, Financial Managers Society, Inc., Suite 2221, 111 E. Wacker Drive, Chicago, Ill. 60601.

1987 Digital Equipment Computer Users Society (DECUS) Fall Symposium. Anaheim, Calif., Dec. 7-11 — Contact: DECUS, U.S. Chapter, BPO2, 212 Boston Post Road, Marlboro, Mass. 01752.

International Data Corp.'s Corporate Computing Conference: DEC vs. IBM, The Challenge Continues. Anaheim, Calif., Dec. 6-9 — Contact: Diane Stretter or Mary Anne Saville, IDC, Box 9015, 5 Speen St., Framingham, Mass. 01701.

Ada Expo '87. Boston, Dec. 8-10. — Contact: Ada Expo '87, P.O. Box 3867, Frederick, Md. 21701.

Dexpo West 87, DEC-Compatible Exposition. Anaheim, Calif., Dec. 8-10 — Contact: Susan Werbach, Expoconsul International, Inc., 3 Independence Way, Princeton, N.J. 08540.

Third Aerospace Computer Security Conference: Applying Technology to Systems. Orlando, Fla., Dec. 8-11 — Contact: Joel Levy, Aerospace Computer Security Associates, c/o ORI, Inc., 1375 Piccard Drive, Rockville, Md. 20850.

1987 Computer Measurement Group Conference. Orlando, Fla., Dec. 6-11. — Contact: Ralph S. Turkowitz, Computer Measurement Group, Inc., 6397 Little River Turnpike, Alexandria, Va. 22312.

Frontiers in Computing — International Conference. Amsterdam, Dec 9-11 — Contact: Frontiers in Computing, c/o CWI, P.O. Box 4079, 1009 AB Amsterdam, The Netherlands.

DEC. 13-19

1987 Winter Simulation Conference. Atlanta, Dec. 14-18 — Contact: Hank Grant, WCS '87, Factrol, Inc., P.O. Box 2569, 2801 Kent Ave., West Lafayette, Ind. 47906.

Winter National Design Engineering Show and Conference. Anaheim, Calif. Dec. 15-17 — Contact: Laura Iacerte, Winter National Design Engineering Show, 999 Summer St., Stamford, Conn. 06905.

Advanced Manufacturing Systems Exposition and Conference/West '87 (AMS West). Anaheim, Calif., Dec. 15-17 — Contact: Cahners Exposition Group, Cahners Plaza, P.O. Box 5060, 1350 E. Touhy Ave., Des Plaines, Ill. 60017.

1987 A&E Expo: The Show & Conference for Architects & Engineers. New York, Dec. 16-18 — Contact: Expoconsul International, Inc., 3 Independence Way, Princeton, N.J. 08540.

Microcomputer Graphics Show & Conference. New York, Dec. 16-18 — Contact: Expoconsul International, Inc., 3 Independence Way, Princeton, N.J. 08540.

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West German managers do not have time for technology

DUESSELDORF, West Germany — Managers of West German limited liability companies do not have the time to deal with information technology and human resources, according to a recent study.

The study, conducted by management consultants Heidrick and Struggles International, Inc., found that according to international standards, there is a lack of farsightedness among West Germany's top managers.

"Managers in Germany 1987" found that managing directors of limited liability companies, which are designated GmbH, fall short of their U.S. and Japanese colleagues in addressing information technology and human resources.

About 25% of the respondents see new technology as part of their responsibility, according to the firm. But on a day-to-day basis, they hardly find time to handle tasks like data processing and office communication.

Of 350 managers interviewed, all spend a minority of their time on new technology. Three named new technology as their priority, compared with 100 who named marketing and sales as their priority.

Very few of the managers had specialized in data processing during their careers and most said education in accounting and finance are the only necessary requirements for their positions.

But the study found West German managers are aware of changes in requirements. About 63% said they believe it is good to be informed about data processing and communication systems, compared with 30% who said the same about marketing and sales.

Beyond MIS

FROM PAGE 101

Di Giovanni likens his MIS management style to a water boy in a football game, doing the necessary legwork so that others can perform their best. "I want to deal with the red tape and politics at my level," he says. "I want to be supportive and to shield my workers from politics so they can do their job."

From the beginning

Di Giovanni says he had no idea what he was going to do for a career after growing up in a middle-income New York neighborhood. With a bachelor's degree in marketing from St. John's University, Di Giovanni first worked as an accountant for MGM Entertainment Co.'s corporate offices in New York in the mid-1960s.

At the time, MGM was having trouble keeping a stable of programmers on staff, so employees were encouraged to study and take aptitude tests for programming jobs. Di Giovanni accepted the challenge and was soon writing his first program in Autocoder language for an IBM 1400 series mainframe.

Around 1968, he migrated to Avco-Embassy Pictures with the mission of building automated financial systems, which had previously been handled by a service bureau.

A stint at Twentieth-Century Fox Film Corp. followed in 1970 and proved to be what Di Giovanni calls one of his most rewarding career experiences. At that time, Twentieth-Century Fox decided to consolidate its corporate offices in New York with its studios in Hollywood. Thus, Di Giovanni was responsible for integrating the company's computer systems.

After several years with Twentieth-Century Fox as a systems analyst, Di Giovanni was called to develop an automated system for collecting daily box office receipts, a project expected to take three or four years. To prepare, he says he spent about six months learning the company from a sales and marketing viewpoint.

"It was a strong period for Fox, around the time we were launching films like *Star Wars*, *The Turning Point* and *Alien*," he says. "I learned the business completely from another perspective to give me a better understanding for the system I would install."

> DI GIOVANNI likens his MIS management style to a water boy in a football game, doing the necessary legwork so that others can perform their best.

Di Giovanni saw the experience as a means of broadening his skills and enhancing his chances to move beyond traditional MIS roles at Twentieth-Century Fox. But the firm's management underwent a shakeout in the early 1980s and Di Giovanni departed for Columbia Pictures and the opportunity to build a DP system for Columbia's West Coast operations from scratch.

He made the switch to Ashton-Tate in 1985, looking for advancement from traditional MIS roles.

Looking back

Focusing on the similarities between film and software helped Di Giovanni's transition between the two industries.

"They are both industries involved in very large development efforts with creative people," he says. "Then, once [the product is] in the can or on disk, they are expensive to launch, and the life cycle is short if the product doesn't work right away."

Despite his decision to move beyond his computer systems career, Di Giovanni stresses that there are more opportunities today than ever before for ambitious MIS staffers and executives. MIS is no longer a dead end, he says, and as corporations become increasingly reliant on information, a data center employee's importance to the company is elevated as well.

"Companies are learning that MIS has to be strategically positioned within an organization, and that the computer is no longer just a big adding machine," he says. "A good employee from MIS who can analyze a department or company and implement a system to make that department or company run more efficiently should be considered for nontechnical, management jobs."

Meanwhile, computers have an increased impact on all aspects of everyday living. As long as there are more computers, there will be more computer operators and managers, Di Giovanni adds.

Today, the new general manager of Ashton-Tate's support services has big plans. He says he and his wife, who is Twentieth-Century Fox's vice-president of labor relations, hope to open a ski resort shop in Colorado four or five years down the road. "It will be the one thing in my career that I plan," Di Giovanni says.

LOCAL HAPPENINGS

NORTHEAST

Boston, Nov. 19. Society for Information Management, Boston Chapter. Monthly meeting. The Organizational Impact of New Technologies, with Raymond J. Epich of The Debold Group, Inc. Anthony's Pier 4. Contact: SIM, P.O. Box 116, Newton Lower Falls, Mass. 02162.

Boston, Nov. 20. Society for the Management of Professional Computing. Member Panel on IC Experiences, with Ed Gaudette of Norton Co. Anthony's Pier 4. 11:45 a.m. Contact: SMPC, 715 Boylston St., Boston, Mass. 02116.

Mechanicsburg, Pa., Dec. 9. Association for Systems Management (ASM), Central Pennsylvania Chapter. Christmas Party and 30th Anniversary. Holiday Inn Hotel. 5:30 p.m. Contact: Mark Anderson, 809 Acri Road, Mechanicsburg, Pa. 17055.

SOUTHEAST

Charlotte, N.C., Nov. 19. ASM, Queen City Chapter. The Leader Manager, with Steven Slater of Wilson Learning. Cosmos Steak House, 5100 E. Independence Blvd. 6 p.m. Contact: Dan Fields, Metro Information Service, 7 Parkway Plaza, Charlotte, N.C. 28217.

Lafayette, La., Nov. 19. Data Processing Management Association (DPMA), Acadiana Chapter. Evangeline Steak House, Highway 167 S. 6:30 p.m. Contact: Debra Billeaud, Guaranty Bank and Trust Co., Fourth Floor, 200 W. Congress St., Lafayette, La. 70502.

Chamblee, Ga., Dec. 8. ASM, Atlanta Chapter. Unix Operating System, with Marie Burch of AT&T. Holiday Inn Chamblee-Dunwoody, 4386 Chamblee-Dunwoody Road. 5:30 p.m. Contact: Jane Roberts, HBO & Co., 1 Ravinia Drive, Atlanta, Ga. 30346.

MIDWEST

Fort Wayne, Ind., Nov. 17. ASM, Fort Wayne Chapter. A View from the Top, with Robert Sanders of Phelps Dodge and Robert Kostrubanic of Tokheim. Lester's, 1502 Bluffton Road. Contact: Beth Hukill, ASM, Suite 103, 10427 Leo Road, Fort Wayne, Ind. 46825.

Toledo, Ohio, Nov. 18. ASM, Toledo Chapter. The Competitive Edge, with Fred Bollin of Arthur Young. The Carranor Hunt & Polo Club. 5:30 p.m. Contact: Dale R. Briggs, Systems Development Division, Marathon Oil Co., 539 S. Main St., Findlay, Ohio 45840.

Southfield, Mich., Nov. 18. DPMA, Detroit Chapter. Voice Computer Systems, with Scott Giesky of Electronic Data Systems Corp. Ramada Inn, 28225 Telegraph Road. 5:30 p.m. Contact: Management Recruiters, Suite 285, 30300 Telegraph, Birmingham, Mich. 48010.

Overland Park, Kan., Nov. 19. DPMA and ASM, Kansas City Chapters. Employing Expert Systems to Gain Competitive Advantage, with Robert J. Benson and Robert Rouse. Marriott Hotel, 10800 Metcalf Ave. 7:30 a.m. Contact: Jon Mings, DPMA, P.O. Box 2425, Kansas City, Mo. 64142.

Indianapolis, Dec. 3. ASM, Indiana Chapter. Joint meeting with EDP Auditors Association: The Fraud and Abuse of Computers Today, with speaker from the U.S. Secret Service. Holiday Inn Southeast, Interstate 465 and Emerson Ave. 6 p.m. Contact: Lloyd Louks, ASM, Banc One Indiana, 450 E. Washington St., Indianapolis, Ind. 46277.

Des Moines, Iowa, Dec. 7. ASM, Des Moines Chapter. Expert Systems Overview, with Bob Keller of Renaissance International Corp. The Howard Johnson Inn, Merle Hay Road. 5 p.m. Contact: Joleen Montag, Integrated Resources Life Insurance Co., 3737 Westown Pkwy., West Des Moines, Iowa 50265.

Toledo, Ohio, Dec. 9. ASM, Toledo Chapter. Rolling with the Punch Lines, with humorist Mary McBride. The Bermuda Supper Club. 5:30 p.m. Contact: Dale R. Briggs, Systems Development Division, Marathon Oil Co., 539 S. Main St., Findlay, Ohio 45840.

WEST

Walnut Creek, Calif., Nov. 18. ASM, East Bay Chapter. Monthly meeting. Contact: ASM, 32 Robert Road, Orinda, Calif. 94563.

Oakland, Calif., Nov. 19. Association for Computing Machinery, Golden Gate Chapter. Monthly meeting. El Cabalo, 67 Jack London Sq. 5:30 p.m. Contact: ACM, Box 26044, San Francisco, Calif. 94126.

El Paso, Texas, Nov. 24. DPMA, El Paso Chapter. Auditing of Operating Systems, with Debbie Pavelka. 5:30 p.m. Contact: Steve Turro, Las Cruces, N.M.

San Francisco, Dec. 2. Association for Women in Computing, Bay Area Chapter. Why People Have Problems Using Software, with Bob Stahl of The Interface Design Group. The Fax Restaurant, 132 Bush St. 5:30 p.m. Contact: AWC, Suite 1044, 41 Sutter St., San Francisco, Calif. 94104.

CANADA

Ottawa, Nov. 24. ASM, Ottawa Valley Chapter. Macro Impact from Micro Presentation Graphics. Ottawa Board of Trade, 185 Sparks St. between Bank and O'Connor.

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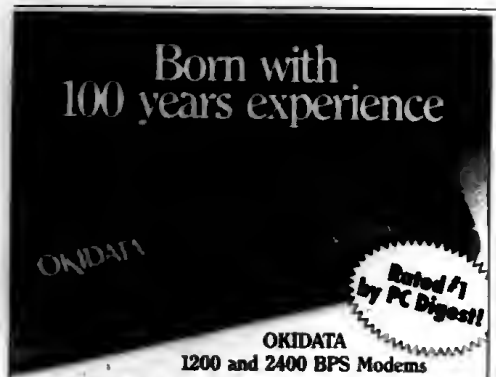

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COMPUTER INDUSTRY

INDUSTRY INSIGHT

Clinton Wilder

Batten down the hatches

When historian Barbara Tuchman wanted to gain perspective on the tumultuous events of the modern world a few years ago, she studied and wrote a book about what she called a "distant mirror" — the events of the 14th century.

Fortunately for the computer industry, our mirror is much closer. To gain perspective on the recent market crash and assess the chances of a computer industry slump in 1988, it is helpful to look at what caused the last one — in the not-so-distant past of 1985.

What has been overlooked in the post-crash fears is that slower overall capital spending was only one factor in battering the profits of mainframe, mini, micro, software and communications vendors 2½ years ago. While capital spending rates — and a strong dollar — were easy scapegoats for many vendors, particularly IBM, there were other root causes of that historic downturn, including the following:

- After an unprecedented computer-buying binge during the previous two years, MIS departments had to slow down and figure out how to manage all of their equipment.
- Top executives of user companies also put the brakes on computer spending because they didn't see enough return, in productivity and efficiency, on their investments.
- On the vendor side, most companies had expanded work forces, capacity and research and development budgets based on rosy 1985 growth forecasts.
- Most important, the "islands of information" syndrome was in full force, as MIS lacked the connectivity tools, software bridges and network management to harness computers purchased in the early 1980s.

Scaling back goals

As this year draws to a close, I believe most major vendors have learned from the mistakes that came home to roost in 1985. They have been through the catharsis of realizing that industry

Continued on page 109

Jury out on Edelman Telex bid

Proposed move, completing Datapoint-Intelogic troika, perplexes some

BY JAMES A. MARTIN
CW STAFF

Datapoint Corp. officials say the proposed takeover of Telex Corp. by Wall Street arbitrageur Asher B. Edelman would create a mutually beneficial relationship between Telex's computer terminal business and Datapoint's local-area network product line.

But some analysts have expressed doubt that Telex, Datapoint and Intelogic Trace, Inc. — the former Datapoint computer services division that was spun off by Edelman after the 1985 takeover — would make an effective trio, as planned. Edelman took over as chairman of Datapoint in 1985 after a successful leveraged buy-out offer.

Last week, Edelman extended the deadline for his $65-per-share tender offer for Telex to this Friday, prompting wide speculation that he will have difficulty arranging financing for the $975 million bid. That skepticism was fueled by the postponement of an unrelated $1.5 billion junk bond financing offer by Southland Corp., which caused investors to sell Telex shares so quickly that trading in the stock had to be temporarily halted on the New York Stock Exchange last Tuesday.

Sticks to plan

Tulsa, Okla.-based Telex, meanwhile, said it will proceed with its own recapitalization plan as a tactic to remain independent [CW, Nov. 9].

Telex and Datapoint each have strengths that will benefit the other, according to Gordon Cardigan, vice-president of communications for Datapoint in San Antonio. "We are solidly based overseas, particularly in Europe, while Telex is not as strong there. Telex has been active in hotel and airline reservation systems, while we have the networking capacity to further enhance those systems," he said.

In addition, Telex's and Intelogic Trace's maintenance businesses would make a solid fit, Cardigan said.

He added, however, that no specific plans have been drawn up as to how and when any integration will occur between the three companies' product lines,

Continued on page 109

Hitachi, IBM near super deal

BY LORI VALIGRA
IDG NEWS SERVICE

TOKYO — IBM and Hitachi Ltd. are hammering out the details of an agreement for Hitachi to supply IBM with supercomputer software, according to reports from Hitachi here.

The two companies already have an agreement for mutual use of programming data stemming from last year's revision of the out-of-court settlement of IBM's 1983 trade secret theft case against Hitachi.

To date, IBM has had a limited presence in the supercomputer market, mainly through its high-end 3090 Model 600 mainframe fitted with a vector processor.

A joint development team from the two companies will work out how to exchange programming information. When IBM Chairman John F. Akers was in Japan last summer, he stressed that IBM wanted to move more into the supercomputer market.

An IBM Japan spokesman

Continued on page 107

Data View

Amdahl's blue bite

U.S. mainframe market share, in dollars, of IBM and plug-compatible vendors

INFORMATION PROVIDED BY ANNEX RESEARCH
CW CHART

CCA goes on the block

BY CHARLES BABCOCK
CW STAFF

CAMBRIDGE, Mass. — Computer Corporation of America (CCA) has been placed on the auction block along with the other technology businesses of its parent company, Crownx, Inc., located in Toronto.

CCA, producer of the Model 204 data base management system, is one of several technology firms that Crownx acquired in 1984 to form the Crowntek Group. Crownx will try to sell the Crowntek units individually.

CCA President Richard D.

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Inside

- Grosse ruling should give AT&T competition in federal contract bid. Page 107.
- IBM's 9370 scores in West Germany but slow in rest of Europe. Page 107.
- NAS, Sun Technology form Canadian joint venture. Page 108.

Tariffs remain a thorn in U.S., Japan sides

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — Although the Reagan administration recently eased some U.S. trade sanctions against Japan, the remaining tariffs are still causing headaches for some U.S. and Japanese computer vendors.

Punitive 100% tariffs are still in effect for all 16-bit laptops imported from Japan, as well as certain "high-performance" desktop computers and motherboards, officials said. The high-performance designation covers microcomputers and boards based on most of the industry-standard chips of the past three years, including the Intel Corp. 80286 and 80386 and the Motorola, Inc. 68000, 68010 and 68020.

The sanctions have prompted Japanese firms such as Toshiba Corp. to move manufacturing operations to the U.S. in order to avoid the tariffs [CW, Nov. 9]. In addition, U.S. vendors are upset that 16-bit motherboards imported from Japan are subject to tariffs, retroactive to April.

Sanctions remain on $161 million worth of "laptop computers and high-performance desktop computers," a White House statement said, because Japan has failed to open its domestic semiconductor market to U.S. suppliers.

AT cloners still plagued

Jack McPhee, computer industry analyst at the U.S. Department of Commerce, said the remaining sanctions apply to micros and motherboards using, in addition to the Intel and Motorola chips, such processors as NEC Corp.'s V60 and V70, National Semiconductor Corp.'s 16032 and 32032 and Zilog, Inc.'s Z8000 and Z80000. Because the tariffs cover the popular 80286 chip, they will continue to be a problem for Japanese makers of IBM Personal Computer AT compatibles.

Although the tariffs were meant to penalize Japanese firms, U.S. computer vendors are also affected because of a U.S. Customs Service ruling that classified motherboards as finished computer products — subject to import tariffs — rather than as parts [CW, Aug. 10].

The Computer and Business Equipment Manufacturers Association (CBEMA) and the electronics industry have been waging a vigorous campaign to overturn the Customs Service ruling, because U.S. vendors import Japanese motherboards in large quantities.

"This problem must be re-

Continued on page 108

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Greene ruling should open FTS 2000 bids

BY MITCH BETTS
CW STAFF

WASHINGTON, D.C. — U.S. District Judge Harold H. Greene has issued a ruling intended to ensure that AT&T is not the only possible bidder for the federal government's $4.5 billion private network contract, called Federal Telecommunications System (FTS) 2000.

The Nov. 6 decision was a victory for Martin Marietta Corp., which is expected to compete with AT&T and perhaps another bidder for the lucrative contract. "It would be very hard for anybody to compete if AT&T had won this decision," a Martin Marietta spokesman said.

AT&T charged that the regional Bell holding companies promised to provide the Martin Marietta team with interexchange switching services that are prohibited by Greene's 1983 ruling on the AT&T divestiture, which forbids the Bell companies from offering long-distance services [CW, Aug. 10].

Services limited

In the recent ruling, Greene said the Bell companies may offer the disputed "tandem switching" services for the FTS 2000 contract only, in order to foster competition for the huge contract.

Greene granted the Bell companies a waiver from the 1983 antitrust decree for bidding on the FTS 2000 contract.

However, he did not rule on the broader issue of whether tandem switching is prohibited by the decree.

Tandem switching involves software that routes the interexchange traffic of a private network by switching that traffic onto the appropriate circuits. It falls into the gray area between exchange and interexchange services, according to industry observers.

Going national

The routing and switching services can be provided by a private branch exchange, a long-distance carrier's central office or a local exchange carrier's central office.

AT&T has far more central offices than Martin Marietta's bidding partner, MCI Communications Corp., so Martin Marietta plans to obtain some of the services from the Bell operating companies in order to provide the nationwide coverage demanded by the federal government.

Preventing the Bell companies from offering tandem switching, Greene said, could "have the effect of eliminating all but one vendor from the bidding process. Such an outcome would not be consistent with the public policies embodied in the decree" that broke up the AT&T monopoly.

An AT&T spokeswoman called the ruling "an unusual resolution of the issue," which ducks the question of whether the switching services violate the divestiture agreement.

"We're simply questioning the use of Bell company switches to switch long-distance calls," she said.

AT&T's opponents in the case, including the U.S. Department of Justice and managers of corporate networks, said tandem switching by local carriers is permissible and is already a routine part of private networks.

The Ad Hoc Telecommunications Users Committee warned that AT&T's position, if broadly applied, would "severely disrupt" many private networks that depend on the Bell companies for tandem switching.

Fair warning

The AT&T complaint is one of several controversies that have plagued the FTS 2000 procurement.

Members of Congress recently forced the government to switch from a winner-take-all contract to a multivendor contract to ensure more competition [CW, Nov. 2].

The contract will be split so that the winning bidder will get 60% of the network business and the runner-up will get 40%. The General Services Administration plans to issue a final request for proposals Jan. 31, with bids due by March 30.

EXECUTIVE CORNER

James C. Castle has been elected president, chief executive officer and member of the Infotron Systems Corp. board of directors.

Castle joins Infotron from IBG Information Systems, Inc., a wholly owned subsidiary of IBG, where he had served as president since 1984.

He succeeds **James C. Hahn**, who will remain at Infotron as vice-chairman of the board and focus on product technology issues.

Floating Point Systems, Inc. (FPS) announced that **Milton R. Smith** has been elected president of the company and will continue in his present position as chief executive officer.

Smith was elected chief executive officer in October 1986 and is a founder and director of FPS. He has served as FPS's general counsel since the company was founded in 1970.

George P. O'Leary has resigned as president, chief operating officer and a director of the company.

C. N. Winningstad, the principal founder of FPS, has been elected chairman of that firm. He has served as vice-chairman since October 1986 and has been filling a leadership role with Lattice Semiconductor Corp. during the past year. Prior to 1986, he served as chairman and chief executive officer of FPS.

Commodore International Ltd. announced that **Max Toy** will join the company as president and chief operating officer of Commodore Business Machines, Inc., the company's U.S. subsidiary. Toy fills the post vacated by **Thomas Rattigan**, who departed earlier this year after a dispute with Chairman Irving Gould.

In this position, Toy will report to Gould. A computer industry veteran, Toy has held top management positions at ITT, Compaq Computer Corp. and IBM. Most recently, Toy was senior vice-president of sales and government products of Xtra Business Systems, a division of ITT.

Stephen B. Greenspan has been elected to the position of vice-president of process development at Seagate Technology. Prior to joining Seagate, Greenspan was vice-president of operations at Tandon Corp., where he was responsible for establishing high-volume manufacturing for Tandon's IBM Personal Computer compatibles.

Prior to joining Tandon, he was employed by IBM for 19 years.

9370 makes German mark

BY AMIEL KORNEL
IDC NEWS SERVICE

MUNICH — IBM's mid-range 9370 is seeing healthy early sales in West Germany, and the buyers are the exact target of IBM's marketing plan — large mainframe customers seeking departmental processors.

Approximately 70% of the 2,000 to 3,000 orders for the 9370 so far in Germany have come from large accounts, according to Peter Scholtes, product marketing manager for mid-range systems at IBM's West German affiliate.

Noting that "the 9370 will be more and more a departmental system," an IBM spokesman pointed out that there has been a low penetration of departmental computing into medium-size companies in West Germany compared with the U.S.

IBM is no doubt eager to distinguish the 9370 from the System/34, 36 and 38 lineup, which has appealed largely to small and medium-size companies. West Germany accounts for approximately 10% of the estimated 160,000 units in that line shipped so far worldwide, Scholtes said.

According to Martin Hingley, a London-based senior consultant for International Data Corp., demand for the 9370, announced in October 1986, seems to be taking off faster in Europe than in the U.S.

"I would expect Germany to sell the most," Hingley said. Elsewhere in Europe, however, the 9370 is moving slowly. It has had a weak start in Britain. "In the UK, no one is rushing over to the 9370."

Steve Schwartz, president of IBM's Systems Product Division, reportedly told a group of UK consultants earlier this month that the firm's UK affiliate has experienced a slower start with the 9370 than any other country.

Hitachi, IBM

FROM PAGE 105

would not confirm or deny the software acquisition report, although he said the swap is allowable under the agreement.

Though IBM could potentially have access to some supercomputer programs from Fujitsu Ltd. stemming from the company's recently arbitrated settlement, IBM has so far declined its option to gain access to Fujitsu software for a specified fee. The IBM Japan spokesman said IBM has enjoyed a friendly relationship with Hitachi since the agreement, but the relationship with Fujitsu has taken quite a different path.

IBM was one of 13 supercomputer vendors represented in a U.S. trade delegation that toured Japan last month. The high-level trade mission followed the August agreement between the two nations specifying a procedure for U.S. companies to bid on Japanese supercomputer contracts [CW, Aug. 17].

The vendor group also included representatives from Alliant Computer Systems Corp., Cray Research, Inc. and Digital Equipment Corp. The delegation included officials from the Office of the U.S. Trade Representative and the U.S. Department of State, four senators and new U.S. Secretary of Commerce William Verity.

"We're not after tokenism. We're after transparency of the market. [We're] after true, fair, open market access," said mission leader Joan McEntee, chief of trade development at the Department of Commerce. "We think purchases of U.S. supercomputers should be commensurate with the competitiveness of the industry," she added.

McEntee called the U.S. government's role an "export promotion" campaign rather than a formal effort at trade negotiations. For example, the group did not broach the subject of the hefty discounting by Japanese supercomputer makers, which sometimes slash prices by as much as 80%.

McEntee said the supercomputer procurement agreement effectively doubled the potential market size. Still, while U.S. supercomputer companies have a 90% share of markets outside Japan, in Japan they hold only a 15% share. Japan is the second-largest market for supercomputers in the world, following the U.S.

CCA

FROM PAGE 105

Stewart said Crownx has set up reserves to sell off the businesses and that CCA will receive its planned 1988 budget with a 12% spending increase. A new release of Model 204, planned for the second half of 1988, will come out as scheduled, along with a microcomputer version.

"They are not putting us under the pressure of a specific time frame. To us, that means we don't have to accept any offers that we don't feel are good ones," Stewart said.

In addition to looking for a buyer, Stewart said, CCA will pursue alternative plans of divestiture, including a leveraged buyout by the present management.

Crownx said it is going to stick to its core business of insurance and health care and divest itself of its real estate, oil and gas and technology holdings. Crownx's backbone business is the Crown Life Insurance Co.

Crownx is taking an extraordinary charge of $100.2 million to divest the Crowntek assets after Crownx suffered losses of $71.8 million in the first nine months of the year. The company would not divulge where the losses occurred, but Crown Life reported a profit of $20.4 million, roughly half its earnings for the same period in 1986.

SUPERSHORTS

Sand Technology Systems, Inc. in Canada and **National Advanced Systems** (NAS), a division of National Semiconductor Corp., have negotiated a Canadian joint venture to be named **NAS Canada, Inc.**

NAS Canada will be 60% owned by NAS and 40% owned by Sand Technology. NAS will have four appointees on North York, Ont.-based NAS Canada's board of directors, while Sand Technology will have three.

Under NAS Canada, the profitable Canadian plug-compatible equipment marketing operations of both partners — with combined annual sales reported at $75 million — will merge.

Opening operations with a staff of more than 150 workers in addition to an installed equipment base that is worth some $200 million, NAS Canada will sell and service complete mainframe and peripheral systems from Hitachi Ltd.

During **Mohawk Data Sciences Corp.**'s annual meeting, shareholders voted overwhelmingly to approve a change in the company name to **Qantel Corp.**

The **Videotex Industry Association** has launched a major study to identify what features are needed in a local telecommunications network to make videotex services more accessible to North American residential and business users.

The study, which is due out in October 1988, is expected to describe the requirements for user commands, billing and security services as well as protocol conversion and processing flexibility for a variety of network transactions.

The **Computer and Business Equipment Manufacturers Association** announced it will form the **TOP Vendors Group** to promote the availability of products that conform to the Technical and Office Protocol.

The **National Science Foundation** has awarded $3 million to the **Semiconductor Research Corp.** for planning the Sematech initiative, which is expected to help U.S. semiconductor firms develop advanced manufacturing techniques in an effort to regain their market leadership.

Advanced Information Management, Inc., a subsidiary of New York-based U.S. Trust Co., announced that it has been renamed **Advanced Information Service Co.** (AIS). The company enacted the name change, which took effect Oct. 1, because of a trade name conflict.

AIS provides packaged software, processing services and software consulting to mutual fund sponsors, brokerage companies and banks.

Fujitsu Microelectronics, Inc., the U.S. semiconductor products subsidiary of Fujitsu Ltd. in Tokyo, has announced plans to construct a semiconductor wafer fabrication facility in Gresham, Ore.

The approximately 100,000-sq-ft facility is Fujitsu Microelectronics' first wafer fabrication plant in the U.S. The company has operated an assembly and test facility in San Diego since 1981.

Approximately $70 million will be invested in the first phase of the Gresham facility, which is expected to begin operation in fall 1988. Plans call for hiring approximately 350 employees within two years.

Syntelligence Corp. announced a complementary marketing agreement for finance industries under **IBM's Industry Marketing Assistance Program** (IMAP). This IMAP agreement allows the two companies to employ a team marketing approach that packages the Syntelligence Lending Advisor System software together with IBM hardware for commercial bank lenders.

Lattice Semiconductor Corp.'s reorganization plan under federal bankruptcy law became effective in September. The company's exit from Chapter 11 protection came 88 days after filing for that protection on July 2. With nearly unanimous approval of the voting classes, the plan was confirmed at a hearing Sept. 16 and became effective following a 10-day grace period.

Tariffs

FROM PAGE 105

solved satisfactorily if the U.S. information technology industry is not to suffer serious long-term damage," said Oliver Smoot, acting president of CBEMA.

"Some motherboards have been freed from the tariffs prospectively, and some have not," said Charlotte LeGates, spokeswoman for CBEMA. "The retrospective problem remains for everyone . . . and the cost is in the many millions of dollars."

The trade sanctions began in April after the U.S. charged that Japan had not fully complied with the 1986 semiconductor trade agreement, which was intended to put an end to what the U.S. considered unfair trading practices [CW, April 27].

U.S. officials complained in April that Japan had failed to stop dumping chips in third-party countries and that it had failed to increase the share that U.S. vendors held in Japan's domestic chip market.

Two weeks ago, the Reagan administration reduced the trade sanctions by $84 million on grounds that Japanese semiconductor makers have stopped dumping memory chips in foreign countries at below-market prices.

The action removed the 100% tariffs on $19 million worth of "low-performance desktop computers," according to a White House statement. Tariffs were eliminated from micros and motherboards using chips that address 1M byte of memory or less, such as Intel's 8086 and NEC's V30.

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Econocom raises bid offer

NEW YORK — Econocom International N.V. last week raised its takeover offer for Decision Industries Corp. by $1 per share and sent a sharply worded letter to the Decision Industries board criticizing its management.

Computer leasing firm Econocom, which had lowered its bid from $11 to $6 per share, raised it to $7 after Decision Industries had called the $6 bid inadequate. In announcing the new bid, Econocom Chairman Jean-Louis Bouchard attacked Decision Industries' takeover defense actions, such as management severance packages commonly known as "golden parachutes."

"Management, with your approval, has put their own personal interests above the interests of the company's shareholders," Bouchard said in his letter.

Econocom's tender offer will expire Nov. 27. Horsham, Pa.-based Decision Industries is the parent of Decision Data Computer Corp.

Edelman

FROM PAGE 105

marketing efforts and management executives.

Telex is an $800 million company with 6,000 worldwide employees, while Datapoint is a $320 million company with 2,773 employees around the globe.

But analysts remain puzzled about how Telex and Datapoint will fit together. "I fail to see where there is any high degree of synergism," said Joe Wagner, display terminal industry analyst at Dataquest, Inc.

Wagner said the two companies' inherent computing philosophies are incongruous.

"Telex's strategy is to concentrate computer power at the mainframe with their terminals being host-dependent, while Datapoint's position is a distributed computing philosophy, dispersing computer power through local-area networks," he said. "They appear to be coming from two different directions."

"The Datapoint fit would be less certain on the service side," said Jim Poyner, technology analyst with Rauscher Pierce Refsnes, Inc. in Dallas. "I would assume there'll be a combination of employee and facility consolidations, though, which could make sense."

Edelman's efforts to acquire Telex have been seriously hampered by the stock market fall, Poyner added.

"Initially, his plan was to have this all done quickly, to get his tender offer done before the stockholders could do a lot about it," he said.

"But the crash has affected his ability to finance the deal and has confused a lot of people in terms of evaluating the worth of their stock," Poyner added.

> TELEX AND DATAPOINT "appear to be coming from two different directions."
>
> JOE WAGNER
> DATAQUEST, INC.

Despite Edelman's $65-per-share offer, Telex's stock has generally traded in the low to mid-50s since the market crashed Oct. 19.

Edelman was not available for comment last week.

Senior editor Clinton Wilder contributed to this story.

Batten down

FROM PAGE 105

growth, based on the people-will-always-need-more-computers mentality, is not a given. They have taken painful steps — layoffs, writeoffs, consolidations, management changes — to survive and make money in less-than-robust times.

At IBM's annual gathering with securities analysts 12 days ago, the change in the Big Blue mentality was palpable. From the company that had its sights on $100 billion in revenue by 1990 just a couple of years ago, analysts and the press heard how IBM expects to grow modestly next year — thanks mainly to its massive cost cuts.

Chairman John F. Akers was predictably quizzed by Wall Street's IBM watchers on the potential business effects of the crash. While Akers noted that 500-point market drops are "outside all of our models," he predicted IBM should stroll along at modest earnings growth next year.

But he stressed that any growth is contingent on one basic but critical factor: "Can we deal with our customers' needs? Our customers say they need a better return on their investment — that their application development is not as efficient as they need it to be. If the IBM company can meet those needs, we can succeed."

And ditto for everyone else. Customers of the computer industry are more sophisticated, more innovative and more demanding than ever before. If DEC, Apple, Tandem, Compaq, Oracle or Sun can keep delivering technology that is worthy of the users' investment, they will prosper. If IBM moves quickly toward the promise of Systems Application Architecture and product-line compatibility, it should do fine.

Is the computer industry recession-proof? Of course not. If capital spending purse strings are knotted tightly, growth rates will be affected. But a large or small vendor with a product set that truly meets an MIS need will be able to loosen that knot.

The industry is bracing for the possibility of economic recession. But companies that learned the most from the lessons of 1985 — both in managing their operations and in understanding what their customers want — will rise to the top.

Wilder is Computerworld's senior editor, computer industry.

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You can't fire me, I quit!

Lack of advancement, communication cause employees to look elsewhere

BY JANET MASON
SPECIAL TO CW

"I quit!" That statement is familiar to managers in any field when the going gets rough. But in MIS — where many good employees are "able to walk across the street and find another job" — the words are heard all too often.

Many companies, however, "don't worry about the turnover, they figure it will be from 15% to 20% each year anyway and just plan for it," says Ronald E. LeBleu, a managing partner with Software People Concepts, Inc. in New Haven, Conn.

I must be going

But what leads MIS professionals to quit? The desire to seek new opportunities, more money and increased status elsewhere are common reasons they give for leaving. However, the MIS environment is also a major factor in causing turnover.

One data administration professional, who declined to be identified, is in his fourth job in 12 years. He finds that companies usually don't provide for advancement. Instead, he says, they offer a fixed position. "Part of the problem," says the Minneapolis-St. Paul-area employee, "is that companies don't see a need for a new position." He adds that he definitely would have stayed in at least one of his jobs if the firm offered an opportunity for advancement.

Stan Durbas, manager of electronic data processing recruiting with Robert Half, Inc. in Hartford, Conn., adds, "Opportunity for advancement, money, office politics, mergers and reorganizations constitute 90% of the reasons why MIS employees leave their jobs."

In companies with poor communication between top management and MIS, the employees often lack a clear picture of the business outside of their departments. The result, says Chuck Wilson, president of South Carolina-based Southern Training and Consulting, Inc., "is that the MIS person often feels frustrated and boxed in and thinks, 'Where can I go in this company besides becoming MIS director?' "

Merger activity, particularly in the banking industry, also causes increased turnover. "When a merger hits, positions are eliminated and people are laid off, especially at the higher level," Durbas says. Because of the threat of layoffs, many MIS employees will begin searching for new jobs when they sense the first hint of a merger.

Often, a merger is a catalyst for a job move that a person may already be considering, says Beth Ann Wilson, director of Philadelphia-based Options, Inc., a career counseling firm. With a merger, "people realize their jobs are not as secure as they originally thought."

> "THE MIS PERSON often feels frustrated and boxed in and thinks, 'Where can I go in this company besides becoming MIS director?' "
>
> CHUCK WILSON
> SOUTHERN TRAINING AND CONSULTING, INC.

Mergers bring new management teams and company reorganizations that often lead to power clashes and personality conflicts. If there is too much friction, an employee may start job hunting after the merger even if he is not laid off.

Some MIS employees quit their jobs simply because they don't like their managers. Options' Wilson says that since MIS employees are rewarded for their technical expertise and not their interpersonal skills, when a conflict arises with their boss they may quit instead of trying to work things out.

Clear communication and understanding are not a hallmark of the relationship between business management and technical professionals. Consequently, companies that provide career paths and management training for other departments often overlook MIS. And MIS employees are hired primarily for their technical expertise, with little thought to the interpersonal skills that will later be needed in supervisory and management positions.

As a result, when a MIS employee leaves one company for another, he often finds himself faced with the same set of problems two or three years down the road.

Employees who leave their jobs to start their own businesses are still in the minority. And, as computer consultant Phil Bagley says, they often do not quit their jobs so much out of dissatisfaction as because of a determination to be on their own.

After the first 12 years working in one area, MIS professionals may consider relocation as a way to boost their incomes. "In that amount of time," Durbas says, "they may have hit the $40,000 or $50,000 mark and realize that they can only go so far in their companies and geographic areas."

Patching the leaks

More companies are trying to reduce the rate of turnover in MIS. According to Southern Training's Wilson, companies are so dependent on the MIS function that they cannot afford to ignore it. "Concerned companies," he says, "especially in the Fortune 1,000, are offering career-pathing opportunities which were not available for MIS people before."

Managers are often in the bind of training MIS employees who then take their expertise to another company. LeBleu says this situation occurs particularly with employees who are hired straight out of college. For this reason, some firms resist hiring younger employees.

Many companies are paying more attention to employee selection and ensuring that the employee becomes part of the company's culture. These companies are also realizing that MIS employees need a "more pleasant, freewheeling environment where they can structure their own work and develop their own projects," LeBleu says. "Most MIS people in this environment will deliver the goods and may even surprise the manager with some new projects."

Mason is a Philadelphia-based freelance journalist.

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(Florida, Georgia, N. Carolina)

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Programmer/Analysts-CICS (561-02) Rapidly-growing company seeks professionals with two or more years of CICS programming experience. **To $35,000 plus bonus.**

Systems Programmer—MVS/XA (561-03) Join an aggressive manufacturing company headquartered in South Florida. MVS internals and two years systems programming experience desired. **To $40,000.**

Sales Representative—Legal Systems (561-04) Major provider of turn-key legal systems seeks a professional to market their complete product line in South Florida. Successful sales background desired. **To $100,000 +.**

Consultants—Big 8 (561-05) IBM mainframe systems development background sought. These are excellent opportunities for senior-level professionals with expertise in manufacturing, financial or health care systems. **To $45,000.**

Programmer/Analyst (561-06) Outstanding opportunity with a rapidly-growing insurance rating software developer. Strong property and casualty insurance background needed. **To $42,000.**

Systems Analyst—Banking (581-07) Florida-based bank seeks a professional to lead a conversion to IBM. Prior banking systems expertise sought. **To $35,000.**

Project Manager—Transportation Systems (561-08) Major transportation industry organization seeks an experienced Project Manager with large-scale IBM-based systems. PC to mainframe exposure a plus. **To $46,000 plus bonus.**

Project Leader—CICS (561-09) Leading services-oriented company seeks a take charge professional to lead the development on new CICS-based systems. Fort Lauderdale location. **To $40,000 plus bonus.**

Data Base Administrator—Adabase (561-10) Progressive company headquartered in West Palm Beach seeks an experienced ADABASE Data Base Administrator. Will perform logical/physical design of all new systems. **To $40,000.**

Consultants—Big 8 (581-01) Will consult with Fortune 500 Companies regarding major system design and direct major design projects. Extensive design methodology experience (SDM-70, Method 1, Yourdon or Warner-Orr) desired. Atlanta and Charlotte locations. **To $51,300.**

System 38 Specialist (581-02) Great opportunity to direct design, analyze and develop new S/38 financial systems. On-line S/38 design/analysis experience desired. Atlanta. **To $39,000.**

CICS Programmer/Analyst—Learn DB2 (581-03) This is an excellent opportunity to trade your CICS skills for DB2 training and experience. Major implementation of commercial and manufacturing systems. Excellent growth opportunity. Atlanta. **To $34,700.**

IBM COBOL Programmer/Analyst—Learn CICS and IMS (581-04) Fortune 500 Company seeks a professional with two to more years IBM OS/COBOL development experience. Strong user interface skills sought. Atlanta. **To $32,400.**

Project Leader (581-05) Strong DBMS (ADABAS preferred) and systems design skills desired. Will lead five Analysts in full life-cycle development project. Atlanta. **To $46,100.**

Insurance Programmer/Analysts (581-06) Industry leader is expanding its Atlanta data center. Will be involved in system development using on-line and data base techniques. Positions range from Programmer to Project Leader. IBM Mainframe COBOL desired. Atlanta. **To $41,000.**

IMS Data Base Administrators (581-07) Three positions are available in Atlanta for IMS Data Base Administrators. Physical design or data base modeling experience and two or more years IMS experience desired. **To $45,000.**

MSA Analysts (581-08) MSA A/P to GL package experience and good communication skills may qualify you for a support position with a nationally-known company. Excellent growth potential. Atlanta. **To $36,600.**

DB2 Senior Analysts (581-09) Rapidly-growing corporate MIS environment seeks OS/MVS professionals with DB2 coding experience. Excellent benefits and an in-house training program. Atlanta. **To $38,700.**

Systems Programmer—MVS XA (581-10) Multiple 3090's utilizing MVS/XA, CICS and networking (ACF/VTAM, NCP). Two or more years MVS internals experience desired. North Atlanta location. **To $44,700.**

Southwest

(Arizona, Arkansas, Oklahoma, Texas)

Programmer/Analysts—New Data Center (381-01) Rapidly-growing company seeks professionals with exposure to COBOL or PL1 and ADABAS experience. This is a ground-floor opportunity. **To $38,000.**

Programmer/Analysts (381-02) Rapidly-expanding Phoenix-based consulting firm seeks Consultants with strong IDMS, ADS/O background. COBOL and CICS experience in an OS/MVS environment sought. Top salary and benefits with excellent growth potential. **To $25,000.**

Software Engineers (381-03) Multiple openings exist for BSEE's with two or more years experience as Software Engineers. Openings are available in signal processing, microwave, radar, satellite communications, electro-optics, power supply, inertial navigation and image processing. Experience with VAX 11/7XX, PDP 11/XX, Fortran, ADA, PASCAL and/or Assembler sought. Phoenix. **To $70,000.**

Programmer/Analysts—IMS Training (381-04) Fortune 100 client has major new development projects. State-of-the-art OS/MVS shop. Two or more years experience using IMS DB/DC with COBOL sought. Development experience with PL/1 and CICS for new on-line transaction systems desired. Excellent training programs, benefits and career progression. **Salaries from $25,000-$39,000.**

MVS/XA Systems Programmer—Multiple 3090 Data Center (381-05) Will work in a state-of-the-art IBM data center with communications to other data centers worldwide. Experience in project management for large systems integration preferred. **To $40,000.**

Programmer/Analyst (381-06) Fast-growing company in new Scottsdale facility seeks a professional with two or more years of IBM experience. IMS data base experience preferred. Will design and program using CICS and COBOL. **To $34,000.**

Programmer/Analysts (381-07) Major SVCS firm seeks Programmer/Analysts to support new system upgrades in 1988. OS/MVS, CICS, COBOL environment. This is an excellent opportunity to enjoy the outdoors and live in a low-cost-of-living area at the base of the rockies. **Salaries range from $30,000 to $38,000.**

Edp Auditor (381-08) This is an excellent opportunity to join the Edp audit staff of one of the leading companies in Phoenix. 35% domestic travel. Excellent company-paid benefits. **To $35,000.**

ACP/TPF Programmer/Analyst—Lead Development (381-09) Fortune 100 financial institution in Phoenix seeks an ACP/TPF Programmer/Analyst with at least three years of ACP/TPF programming experience. Will lead the development in the ACP area. Excellent opportunity with a stable, growing organization. Excellent benefits. **To $40,000.**

Senior Programmer/Analyst—Growth Opportunity (381-10) Dynamic organization involved in the development of a 4th Generation Data Center seeks a professional with six or more years experience and heavy technical exposure to OS/MVS, COBOL, IDMS, ADSO ADSA, CICS and FOCUS. Excellent benefits, promotional opportunities and flex time. **To $40,000.**

CICS Systems Programmer (461-07) Three years experience as a CICS Systems Programmer sought. Excellent benefits including relocation assistance. Arkansas location. **To $42,000.**

Artificial Intelligence/Expert Systems (461-01) Fast-growing Tulsa-based company seeks a professional with one to three years experience with artificial intelligence or a Master's degree in Artificial Intelligence. Relocation assistance. **To $40,000.**

Systems Programmer (461-02) Tulsa-based firm seeks a professional with five years of systems programming experience in a MVS environment. Experience in the installation and use of IBM mainframe graphics sought. Relocation assistance provided. **To $50,000.**

Programmer/Analysts—All New Developments (461-03) Two or more years experience programming in C under VMS to UNIX desired. This is a ground floor opportunity with plenty of room for advancement. **To $35,000.**

Senior Programmer/Analyst (461-04) Two years VAX experience using DIBOL to Fortran and Oracle sought. Southern Oklahoma location. Excellent benefits including relocation assistance. **To $38,000.**

Programmer/Analyst (461-05) Growing Tulsa firm seeks a professional with two years ACP/TPF applications coding experience. Relocation assistance provided. **To $45,000.**

Data Modeler (461-06) National company in Tulsa seeks a professional with data modeling experience. (JANUS preferred). **To $46,000.**

UNIX Software Development and Support (501-04) Integrated UNIX systems and applications software firm is expanding their Dallas-Ft. worth regional office. Two or more years technical experience with UNIX, XeniX or a look-a-like operating system desired. Technical, marketing support and account management career paths available. **To $45,000.**

Graphics Software Development (501-05) Suburban hardware/software developer is in the early stages of several new projects. Will use leading graphics systems, including HP, SUN APOLLO and Silicon graphics. Three years of real-time software programming in C or a mix of C and PASCAL desired. UNIX and VAX strongly preferred. **To $48,000.**

On-Line Programmer/Analysts—New Data Center (501-01) Suburban Dallas data processing organization with a five-year commitment is adding eighteen Programmer/Analysts before January 1988. Three or more years IBM COBOL program development experience using an on-line TP monitor. CICS experience preferred. **To $41,000 plus bonus.**

Edp Audit Manager (501-02) Dallas headquarters of international company seeks a certified Edp Audit Manager with management experience in a large IBM environment. CPA, CISA to CIA preferred. The technology is IBM/MVS/IMS/CICS. **To $43,000.**

Project Manager—New Systems Development (501-03) Large new edp organization in the Dallas-Ft. Worth area has just approved a three-year systems development plan which includes significant on-line, data base financial applications. Will manage seven to ten Programmer/Analysts. IBM/MVS/COBOL and either IDMS or CICS project management experience sought. **To $52,600 plus bonus.**

Customer Support Representative (511-01) Large national systems software vendor is staffing their Dallas support team. Will support products and develop and maintain system software. A minimum of two years ALC experience under MVS sought. **To $45,000.**

System Software Development—Expansion Positions (511-02) One of the largest systems software vendors in the U.S. is expanding their Dallas development group. A minimum of three years ALC under MVS sought. System software development or maintenance experience desired. **To $40,000.**

Programmer/Analyst—Multiple Positions (511-03) One of the largest banks in Texas is staffing their Dallas location. Will be involved in on-line, new development and user support. A minimum of four years COBOL and IMS DB/DC experience and excellent communication skills. **To $40,000.**

Senior Programmer/Analyst (511-04) Top ten life insurance company in the U.S. is expanding their Dallas location. Three years of MVS/COBOL with life insurance experience. CICS, actuarial systems, McCormick and Dodge general ledger, ALC and IMS desired. **To $37,000.**

Systems Manager—Consultant (511-05) Big 8 accounting firm in Dallas is growing in the systems practice area, creating a need for a Systems Consultant with at least eight years of systems programming experience under MVS utilizing IMS, CICS or VTAM. Capacity planning experience a definite plus. **To $70,000 plus bonus.**

Programmer/Analyst (531-01) As a result of a strategic merger, a well-known financial giant has stepped aggressively into the world of international finances. Several new projects are under development using the latest relational data base technology. Experience with COBOL and/to ALC with any relational data base sought. **To $42,000.**

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Programmer/Analyst (581-03) Progressive data center is actively seeking professionals with expertise in OS/COBOL, PL/1 or FOCUS in either insurance, banking or the financial arena. Low cost-of-living and a four-day work week! **To $40,000.**

Data Base Manager (531-04) South Texas data center seeks a professional with IMS DBA skills. This is a new position due to a major expansion effort. Full relocation assistance. **To $60,000.**

DB2 Systems Programmer (531-05) Nationally-known industry leader in South/Central Texas offers a challenging position with the responsibility of installing and supporting DB2. This is a multi-CPU, MVS/XA environment that will continue to expand. Excellent benefits, professional surroundings and a four-day work week. **To $56,000.**

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Several opportunities exist, including management, to provide data and models of systems operating in transaction processing environments. Responsibilities include performing benchmarks, characterizing Digital's products' performance, developing, tuning and configuring guidelines, analyzing competitor offerings and evaluating design and strategy alternatives in support of systems planning, systems architecture and technology groups.

A BA/BS or equivalent in computer science or a related technical discipline is required; MS/PhD is desirable. You must have at least 3 years' performance analysis experience in analytic and/or simulation modeling; large-scale mainframes used in TP environments; and operating systems (other than Digital's).

WORKLOAD CHARACTERIZATION

Join this unique group specializing in the characterization of TP applications. You will research and analyze the anatomy of application systems in different industries, defining the relationship between the business units and computer resources. You will conduct application audits using a variety of techniques including interviews, questionnaires and computer performance measurement tools. The results of your studies will be entered into a knowledge base that will help both marketing and engineering organizations understand the users' needs.

We seek individuals with advanced degrees in business or operations research and at least 5 years' experience in evaluating, designing and implementing TP systems. Strong communications skills are required; as well as familiarity with computer performance issues.

MODELING AND PERFORMANCE TOOLS EVALUATION

Explore the usage and availability of modeling, simulation and performance analysis tools. Where necessary, design tools and methods for computer performance data collection. Assist product positioning and workload characterization groups in selection and implementation of computer performance measurement techniques. Participate in developing a knowledge-based system that will configure computer systems according to business application needs.

You must have an MA/MS or equivalent in computer science or a related discipline and 3 years' experience in the areas of performance analysis, capacity planning, and modeling or simulation of computer systems.

SOFTWARE DEVELOPMENT

Work on a team of software engineers. Design, develop and debug an applications characterization and evaluation system to be used by marketing and engineering organizations to assess workloads and system configurations. Utilize expert systems techniques and provide user-friendly interfaces. Design, develop and debug TP benchmark applications for testing hardware configurations (both Digital and other vendors).

A minimum of a BA/BS or equivalent in computer science or a related field is required. At least 3 years' experience in software development. Knowledge of VMS* is desired.

TP Systems Design Consulting

CONSULTANTS

Our design consulting group has many opportunities for technical consultants looking for significant customer interaction and for the challenge of analyzing the customer's existing or proposed system design needs to ensure the desired performance, functionality and capacity requirements are met. Responsibilities will include the analysis of design requirements and proposal of systems configurations that not only meet today's needs, but also scale to meet tomorrow's needs. Candidates should enjoy travel and have a BSEE/CS or equivalent, a minimum of 5 years' experience designing and implementing TP systems, and excellent communications skills.

TP Software Engineering

SOFTWARE ENGINEERS

Participate in the design, development and delivery of high performance TP systems. Areas of focus include forms management, DBase management, networking PCs, graphics, software performance tuning, Clusters and test system development. Ideal candidates will have experience as VAX/VMS users or developers, 5+ years of software development experience, knowledge of MACRO 32 as well as commercial and scientific languages.

TP Software Services

SOFTWARE SPECIALISTS

Our software services engineering group has several opportunities available for software specialists. You will provide high-level, on-site technical support to our customers, perform field test support and develop software services courses.

You should enjoy travel, have a BSCS or equivalent and at least 2 years' experience in VAX/VMS, transaction processing and large commercial applications.

For TP Software Services positions only, send your resume to: Fred Arno, Department 1119 7804, Digital Equipment Corporation, Continental Boulevard, Merrimack, NH 03054.

Be part of the team. Send your resume now to: Martha Minnick, Department 1119 7804, Digital Equipment Corporation, 200 Forest Street, MRO1-1/M5, Marlboro, MA 01752.

*Trademark of Digital Equipment Corporation.

• We are an affirmative action employer.

digital™

"Simply put, Computerworld delivers just what we're looking for: top-quality job applicants."

Roger Fraumann
Staff Director
Lachman Associates, Inc
Westmont, IL

Roger Fraumann is Staff Director for Lachman Associates, Inc. (LAI) of Westmont, Illinois. It is one of the largest privately held computer systems software consulting and development firms in the United States. And Roger is pleased to report that plans call for continuing the 50% annual growth every year for the next five years.

Roger is also pleased with Computerworld's contributions to the company's growth. When he needs qualified people to fill positions as the company grows, he turns to Computerworld.

"Computerworld is the only national publication that we routinely advertise in," says Roger. *"Last year we determined that we needed consistent national exposure. We chose Computerworld, which gave us exactly that. Simply put, Computerworld delivers just what we're looking for: top-quality job applicants."*

"We get about 20 responses per ad, and what really counts is that those responses yield at least two quality applicants per ad," Roger explains. *"Overall, a higher percentage of quality people respond to our ads in Computerworld, as opposed to what other publications deliver. Computerworld works for us."*

Plus, Roger has found added incentive to advertise in Computerworld: *"The same ad that runs nationally in Computerworld costs twice as much to run in the Chicago Tribune, a local newspaper,"* he notes.

Since LAI began advertising in Computerworld, the company has gone from 50 to 130 full-time professionals. *"We've been in Computerworld about every other week. And with the company's plans for growth for the next five years, we're going to continue advertising in Computerworld,"* says Roger.

Computerworld. We're helping employers and top professionals get together in the computer community. Every week. Just ask Roger.

For all the facts on how Computerworld can put you in touch with qualified personnel, call your local Computerworld Recruitment Advertising sales representative.

COMPUTERWORLD

BOSTON: 375 Cochituate Road, Box 9171, Framingham, MA 01701-9171, (617) 879-0700

NEW YORK: Paramus Plaza I, 140 Route 17 North, Paramus, NJ 07652, (201) 967-1350

WASHINGTON, D.C.: 3110 Fairview Park Drive, Suite 1040, Falls Church, VA 22042, (703) 876-5100

CHICAGO: 2600 South River Road, Suite 304, Des Plaines, IL 60018, (312) 827-4433

LOS ANGELES: 18004 Sky Park Circle, Suite 100, Irvine, CA 92714, (714) 261-1230

SAN FRANCISCO: 18004 Sky Park Circle, Suite 100, Irvine, CA 92714, (415) 322-33314

An IDG Communications Publication

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COMPUTER PROFESSIONALS COMPANY

Houston's premier software design and contract-programming firm is paying TOP $ for challenging positions, and the cost of living is at an all-time low on the sunny Gulf Coast!

- ONGOING REQUIREMENTS -

- IMS DB/DC (PL1)
- DB2, SQL, SQL/DS, ORACLE
- FOCUS, SAS, MARK IV

If you have solid experience in any above, send resume to **CPC, 6135 Breasheather Dr., Houston, TX 77096, or call (713) 771-9528.**

Senior Applications Analyst/Programmer

ATD a leading O.E.M. Automotive Supplier has an opening for a Senior Applications Analyst/Programmer. The successful candidate will plan, design and install DP applications, develop support documentation, and assist system users.

Qualifications include a BA/BS/AS/Business/Computer Science, 6+ years experience, OS/MVS, VM, CICS. Must have experience in manufacturing applications, familiarity with MSA, PICK or EDI a plus.

We offer a competitive salary and benefits package. Send resume and salary requirements to:

Vivian Rowley
Employee Relations Manager
ATD
39600 Orchard Hill Place
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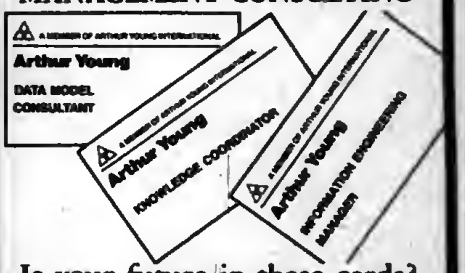

Is your future in these cards?

Perhaps. If you're a systems professional currently working with or ready to work with the state-of-the-art in information systems development, then Arthur Young wants you!

Creativity, a commitment to excellence, and three to nine years experience in an IBM environment will give you the opportunity to explore your future with Arthur Young.

Our reputation of direct, personal involvement with our diverse, blue-chip clientele has made us one of the most rapidly growing Information Technology Consulting groups in the Southwest. So we have a strong need for professionals in our expanding consulting practice.

Positions available in Dallas, Houston, St. Louis, Kansas City and other Southwestern and Midwestern locations.

Send your resume and salary history, in complete confidence.

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Richard Bell
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Dallas, Texas 75201 (214) 969-8297

It's new! And it's the efficient way to recruit qualified computer professionals.

Now you can target your recruitment advertising to the qualified computer professionals you want to reach - where you want to reach them. All you need is the new IDG Communications Computer Careers Network. Here's how it can work for you:

You choose the newspapers. Depending on who you're looking for, you can select the combination of eight newspapers that best suits your needs - **Computerworld, InfoWorld, Network World, Digital News, Federal Computer Week,** and **Computer Currents**-/Northern California, Southern California, and Boston Editions.

You choose the region. If you wish to recruit within a specific area, you can advertise in the regional editions of the newspapers you choose - East, West, or Midwest. Of course, national buys of individual newspapers or various combinations are also available when you need to extend your reach.

You don't pay for readers you don't want. Gone are the days when you have to worry about paying for waste circulation. The Computer Careers Network puts you in touch with qualified computer professionals - and only those qualified computer professionals you need to reach.

To put the new Computer Careers Network to work for you - regionally or nationally - call the sales office nearest you. Or contact John Corrigan, Recruitment Advertising Director, at 617-879-0700. And if you hurry, you can still get in on the special low introductory offer.

Sales Offices: **BOSTON**: 375 Cochituate Road, Box 9171, Framingham, MA 01701-9171, (617) 879-0700; **NEW YORK**: Paramus Plaza I, 140 Route 17 North, Paramus, NJ 07652, (201) 967-1350; **CHICAGO**: 10400 West Higgins Road, Suite 300, Rosemont, IL 60018, (312) 827-4433; **LOS ANGELES**: 18004 Sky Park Circle, Suite 100, Irvine, CA 92714, (714) 250-0164; **SAN FRANCISCO**: 18004 Sky Park Circle, Suite 100, Irvine, CA 92714, (415) 322-3314

SUPERVISOR EDP AUDITOR

New Orleans, Louisiana

Hibernia National Bank, one of the most successful banks in the Southeastern United States, is seeking a Supervisor of EDP Audit to manage a staff of three.

Primary responsibilities include operating systems audit, participation in operational audits, and review of new system development. Hibernia has an IBM 3090-Model 200 operating systems OS/MVS XA and uses standard COBOL.

Qualifications include a minimum of 5 years of experience in system support and EDP auditing in a large IBM environment along with excellent oral and written communication skills. EDP Audit experience at a banking institution is preferred, but not required. College degree in related area required with additional certification desired. Experience in supervision a plus.

Hibernia Corporation has achieved an impressive record of growth and profitability. Join a leader which offers career advancement, attractive compensation and an excellent Flexible Benefits Program.

For confidential consideration send your resume to:

Corporate Recruiter — C
Hibernia National Bank
Recruiting Department
P.O. Box 61540
New Orleans, LA 70161

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Member FDIC

INFORMATION CENTER SPECIALIST

PMI Food Equipment Group, located near Dayton, Ohio is the leading supplier of equipment, systems, and service to the world's food industry. Its Products, marketed under Hobart, Vulcan, Foster, Stero, Tasselli and Wolfe trademarks, are sold in more than 100 countries.

We are seeking a qualified individual to join our MIS staff as an Information Center (IC) Specialist. The IC Specialist will provide consulting and training to PMI Food Equipment Group employees in the use of end-user computing tools. He/she will also be responsible for the support and development of mainframe and microcomputer applications utilizing productivity tools. Candidates for this position should have 3 to 5 years of IBM data processing experience to include programming and project analysis. Experience in the use of relational database technology, preferable DB2 is required. Must have a four year degree in Computer/Information Science or Business related. The position requires excellent oral and written communication skills.

If you are interested and qualified, send resume to:

EMPLOYEE RELATIONS DEPARTMENT (EMR)
PMI FOOD EQUIPMENT GROUP
WORLD HEADQUARTERS
TROY, OHIO 45374

Announcing

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NETWORK

It's new!

And it's your key to reaching the right people in the right places at the right price.

As the world's largest publisher of computer-related newspapers, only IDG Communications can give you this unique method of targeting your recruitment advertising to the professionals you want to reach, where you want to reach them.

You choose the newspapers. There are eight computer and communications-oriented newspapers in the network, reaching every type of computer and communications professional. Depending on who you are looking for, you can choose the publications that suit your needs.

You choose the region. You can advertise nationally in any one newspaper at regular rates, or any combination of publications at special rates. Or you can choose to concentrate in one or more of three regions — East, Midwest and West. You automatically get a three-newspaper buy, *Computerworld, InfoWorld* and *Network World*. *Then you can add on one or more other publications. For example, if you are in the Boston area, you might want to add the Boston edition of Computer Currents.* Or if you are looking for a VAX programmer in the Midwest, you may want to add Digital News Midwest edition.

You don't have to pay for readers you don't want. When you advertise in the Sunday paper, most of the people you are reaching have nothing to do with computers. But you have to pay for them anyway, since rates are based on total circulation. The Computer Careers Network rates are also based on total circulation, but all of that circulation and readership are computer or communications-involved professionals.

You can reach professionals who aren't actively looking. Our research indicates that roughly 10% of computer professionals may be actively looking for a job at any given time. The other 90% will not be reading the Sunday classifieds. But more than half of computer professionals would consider other job options at any given time if they became aware of them, and those are the hidden stars that you can reach in the pages of their professional newspapers — the ones they read for the information they need to stay ahead.

Computerworld, a weekly newspaper with a total audited reach of more than 650,000 (U.S.) computer-oriented professionals, carries more recruitment advertising than any other specialized business publication. Every week, it delivers the latest news to information systems executives and specialists at medium to large organizations, as well as the executives at the computer industry vendor organizations that serve them. Its readers include MIS directors and managers, systems analysts, programmers, sales and marketing professionals and other computer-involved executives.

InfoWorld is the weekly newspaper edited for personal computer professionals at organizations using multiple systems. It has a total audience (subscribers and pass-along readers) of 420,000, including PC managers, software developers and other PC-oriented professionals.

Network World is the news and features weekly for larger users of communications and networking. Its 220,000 readers (including subscribers and pass-along readers) include voice and data communications managers and specialists as well as communications consultants.

Digital News is a biweekly newspaper for computer professionals who work with the VAX line of computers from Digital Equipment Corporation. Total readership, including subscribers and pass-along readers, is over 210,000, including computer executives and managers, systems analysts, programmers, engineering executives and staff, and other VAX-oriented computer professionals.

Federal Computer Week is edited for information systems executives and staff who work in and sell to the federal government. Its weekly circulation includes MIS executives and managers, as well as systems analysts, programmers, software developers, communications specialists and other information systems professionals. Total readership (including paid and pass-along) exceeds 120,000.

Computer Currents is a group of regional publications edited to meet the needs of business and professional users of personal computers in the region covered.

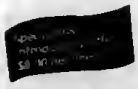
Computer Currents/Northern California Edition is published biweekly and has a total circulation of 75,000. Total readership exceeds 225,000.

Computer Currents/Southern California Edition is published monthly and has a total circulation of 78,000, with a total readership of 234,000.

Computer Currents/Boston Edition covers the entire eastern Massachusetts and southern New Hampshire area with a monthly circulation of 40,000 and total readership of 120,000.

Circulation plus projected pass-along audience

	EAST	MIDWEST	WEST	TOTAL U.S.
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Subtotal	**573,358**	**405,542**	**311,174**	**1,290,074**
Digital News	106,468	52,252	53,280	212,000
Federal Computer Week	74,412	20,883	25,083	120,378
Computer Currents				
Northern California Edition			225,000	225,000
Southern California Edition			234,000	234,000
Boston Edition	120,000		120,000	
Total	**874,238**	**478,677**	**848,537**	**2,201,452**



Regional Buys

Here's how to place your recruitment advertising regionally:

The basic recruitment "package" automatically delivers your advertisement in three leading computer newspapers — *Computerworld, InfoWorld*, and *Network World* — AND in the region of your choice. Whether you choose the East, West, or Midwest, you pay just **$8.00 per line.** And if you want, you can add a second region to your three-book buy for a total cost of **$15.00 per line.**

This basic package includes three of the eight newspapers available to you through the IDG Communications Computer Careers Network. You can also schedule *Digital News, Federal Computer Week* and *Computer Currents* (Northern California, Southern California, or Boston edition) — to help you reach all the right people in all the right places.

Regional Combination Buys

	1 REGION	2 REGIONS
[redacted]	[redacted]	[redacted]
PLUS		
1 addition	$10.00	$17.00
2 additions	$12.00	$19.00
3 additions	$14.00	$21.00
4 additions	$15.00	$22.00
5 additions	$16.00	$23.00

Please note: This special introductory offer is valid only through December 31, 1987. Individual contract rates do not apply, and no lower rate is available.

National Buys

And here's how you can buy nationally to get the maximum reach possible:

Sometimes you need national exposure for your recruitment advertising. That's when you can put these advertising opportunities to work for you.

Combination buys. These special combination buys allow you to recruit computer professionals nationally using the combination of newspapers that's right for you.

Choose from. *Computerworld, InfoWorld, Network World, Digital News*, or *Federal Computer Week*.

National Combination Buys

	RATES PER LINE[1, 2]
Combination of 2	$15.00
Combination of 3	$17.00
Combination of 4	$19.00
Combination of 5	$20.00

1) *Computerworld* contract advertisers — Determine your discounted line rate, by deducting the difference between *Computerworld's* open line rate and your current contract rate from the above combination rates.

Example:

$12.60 open line rate
− 11.35 contract rate
$ 1.25 difference

Your discounted rate of a combination of two publications would be $15.00 − $1.25 = $13.75.

2) If your combination buy does not include *Computerworld*, your Computer Careers national rate may be lower. To calculate, start by adding the stand-alone rates of the respective publications (*InfoWorld* — $9.29, *Network World* — $5.00, *Digital News* — $5.00, *Federal Computer Week* — $3.60). Then deduct 10% from the total.

Example:

$ 9.29 InfoWorld
+ 5.00 Network World
$14.29 Total
− 1.43 less 10%
$12.86 discounted rate

To put the IDG Communications Computer Careers Network to work for you, call the sales office nearest you — or contact John Corrigan, Recruitment Advertising Sales Director, at 617-879-0700. Just one quick phone call can give you all the information you need on running your recruitment advertising — regionally or nationally — in up to eight leading industry newspapers.

FLORIDA

PA TANDEM, COBOL	to $38K
SYS MGR, DEC VAX	to $39K
SR PA VAX/VMS C	to $42K
LAN TECH 3 COMM SFTWR	to $34K
SA OFFICE SYS DISOSS	to $40K
SE PROD DEV C, LAN	to $35K
S & P MGR DISTRIBUTION	to $43K
MGR VOICE & DATA	to $55K
INFO CTR MGR	to $60K
PA HONEYWELL IDS2, DMIV	to $35K
PA CICS, COBOL	to $38K
PA LOAN SFTWR DEV	to $40K
PA HOGAN SYSTEMS	to $40K
QA ANALYST	to $40K
TECH WRITER IBM MF	to $37K
SR SA SALES SYSTEMS	to $40K
SW ENGR PC BD DESIGN	to $40K
SYS PROG DOS/VSE	to $42K
EDP AUDITOR	to $39K
SYS PROG MVS	to $55K
OPS MGR OS/MVS	to $38K
PA C INFORMIX	to $38K
PA ORACLE SQL	to $38K
POS COORDINATOR	to $32K
OPS MGR DOS	to $40K
SR SYS PROG VM DOS/VSE	to $50K
NETWORK ANAL SNA	to $50K
CHANGE/PROB MGT ANAL	to $38K
SYS PROG DOS/VSE, VM	to $50K
PA CICS, DL/1	to $42K
INFO CTR ANAL FOCUS, VM/CMS	to $45K
SE UNIX C, X.25	to $50K
SE NOVELL, C, ASAM	to $40K
PA SERIES 1, EDX, EDL	to $40K

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TRW's Data Services Division provides centralized Data Processing support to the internal TRW user community. We provide operations, data entry, and reports distribution; applications design, development, and support for PC's, mini's, middles, and mainframes; as well as system support for VM, MVS, UNIX, RSTS, RSX-11, VMS, NOS, PRIMOS, ACF2, IMS, IDMS, DASD, and other tools and utilities too numerous to mention.

If you would like to join a big data processing organization with all the benefits of a small company environment, explore the following positions currently available:

IDMS Database Administrators
Designs and implements large business applications databases in an IDMS, large mainframe IBM environment. Includes both physical and logical design, as well as database performance, migration and technical support. Requires a minimum BS and 5 years database administration, 2 years of which must have been in support of IDMS databases.

IDMS Programmer/Analysts
Designs and develops business applications using ADS-O and COBOL in a highly sophisticated development environment. Workstations include IBM PC/AT based systems with many state-of-the-art tools. Requires minimum BS and 2 years business applications development in an IDMS ADS-O, large mainframe IBM environment.

PC Applications Programmer/Analysts
Designs and develops complex project management, cost control, tracking, pricing and configuration management systems in a Clipper, dBase III+ environment. This is high reliability software being created in a leading edge PC applications development environment. Requires a BS and expert level Clipper and dBase III+ skills.

Programmer/Analyst
To develop and maintain extremely complex and sophisticated financial applications for our worldwide financial data processing center. Applications are developed on Prime 9955, running Primos, in Fortran 77 and Prime's FGL, Prime Information. Requires a BS and a minimum 3 years financial applications development in Fortran 77 in a Primos environment.

VMS Systems Programmer
Installs, upgrades and supports VMS and related utilities at the assembly language, internals level. Provides capacity planning, operations planning, operator assistance and hardware installation coordination. Requires a BS and a minimum 3 years VMS systems internals support.

Decision Support Systems Programmer Analyst
Provides business and financial management user community with the latest in mainframe and PC tools for decision support. Make mainframe databases available to user on TSO, VM/CMS, and PC interfaces using decision support languages such as STRATAGEM, 4GL's such as FOCUS and 3GL extract programs. Requires minimum BS and 5 years mainframe IBM business applications development including 2 years supporting decision support systems experience.

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TRW offers an outstanding salary and benefits package including flexible hours, medical, dental, vision-care plans, stock participation, and year-end holiday week shutdown. For immediate consideration, please send your resume to: **Robert Chambers, TRW OSSG, P.O. Box 188, Dept. CW, Manhattan Beach, CA 90266.** Tomorrow is taking shape at a company called TRW.

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TRW

System Developers
800-231-5920

Inviting resumes from individuals in the more highly technical computer related vocations such as: PHD Computer Scientists, Operating System Developers, Data Base Developers, Peripheral Specialists, Networks and Telecommunications, Architecture, Artificial Intelligence, Graphics Systems Developers, Microcodes and Firmware Developers, Compiler Development, etc. Specialist trained in emerging technology such as expert automations, CASE, ADA, etc. Better trained in scientific applications development including defense, process control, data acquisition, telemetry and communications, CAD/CAM, simulation and modeling, etc.—we are a professional employment firm managed by graduate engineers. Fees are paid by the employer. All geographic locations. Send resume or call D.A. Roberts and ask for our free market bulletin & career planner.

Scientific Placement, Inc.
P.O. Box [illegible] Houston, TX 77024 [illegible]
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SOFTWARE PROFESSIONALS

Rand Systems Corporation has opportunities for experienced professionals with skills in the following areas:

- IBM S/36, S/38, S/34 - RPG III, RPG II
- IMS DB/DC, CICS, COBOL, PL/1, ENSE, PRO IV, HOGAN
- VAX/VMS, PDP-8/RSTS, DBGL, COBOL, PASCAL, SCSA, DBMS
- Positions available at all levels

Rand Systems Corporation, with fourteen years of experience serving our clients across the country, is preparing for another period of major growth in our exciting industry. Members of our technical staff are challenged with exciting state-of-the-art projects and are provided extensive benefits, including fully paid health, medical and dental coverage, paid overtime and 401K. Please call Anita Loizos at 313-855-6877 or send resume to:

RAND SYSTEMS CORPORATION
7071 Orchard Lake Road, Suite 306
West Bloomfield, MI 48322
(313) 855-6877

RAND SYSTEMS CORPORATION

All replies held in strictest confidence

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Larry Grafitz, Triple-I Systems Engineer

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- **Systems 38/RPG III**

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1200/300 Baud ASCII

iii information industries inc.
8880 Ward Parkway, Suite 200
Kansas City, MO 64114

SAUDI ARABIA

Opportunities exist with SYSOREX INFORMATION SYSTEMS in Riyadh, where we are assisting the U.S. Customs Service and the Saudi Arabian Department of Customs in a major automation effort. This involves the installation of DP application systems using IBM PS2 workstations and LANs at approximately 40 sites around the Kingdom, connected to a central IBM mainframe running MVS with ADABAS and NATURAL. Opportunities are as follows:

Systems Designer
PC/LAN Applications

Prime responsibility will be to assume the leadership role in the design of complex applications. Using our structured methodology, you will produce data flow diagrams and structure charts. Subsequently, you will coordinate the development and testing of the application systems.

Applicants should have a college degree plus 5 years experience in development of applications, including at least 2 years systems design in a structured environment, 2 years 'C' programming experience, and exposure to distributed processing, preferably using LANs.

Programmers
PC/LAN Applications

Applications for the network environment are developed in 'C' using BTRIEVE. Prime responsibility is to participate in the development and testing of programs, using our structured methodology (STRADIS).

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You will perform data analysis, modeling and normalization activities, develop logical and physical data structures, develop data base related standards and procedures, supervise test and production data base maintenance and support activities; design and install IMS data bases for large scale IBM systems; provide for data base performance analysis and tuning activities. These positions require 1-7 years data processing experience including 1-3 years recent background as a Data Base Analyst or Administrator in an IMS DB/DC environment and 2-4 years in IMS DB/DC applications analysis and programming.

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A career in the rapidly growing field of computer systems security. Take part in designing protection for an IMS network running 6 million transactions a day and developing security procedures for an increasingly large number of microprocessors. Your background should include 5 years data processing experience including 3 years in Systems Development, 2 years computer security experience, Bachelor's degree or equivalent work experience. Knowledge of ACF2 or RACF preferred. COBOL and IMS knowledge preferred

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Positions require background in UNIX* and "C" and a knowledge of device drivers. Must have experience in one or more of the following areas: async/sync host communications (e.g. IBM, Sperry, Burroughs); LAN's, Wide Area Networks (PDN/ DDN) including protocols such as TP-4, TCP/IP, or ISO/OSI standards.

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Positions require 1 to 3 years experience with Relational Database management software running under the UNIX* operating system (e.g. Oracle, Ingres, Unify, or Informex).

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Data Processing

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Operating Systems

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ATLANTA DALLAS dp

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This position is available with the State of Illinois, Department of Nuclear Safety, Springfield, Illinois, which is an Equal Opportunity Employer and encourages applications from qualified minority and female candidates.

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For consideration, send your resume to:

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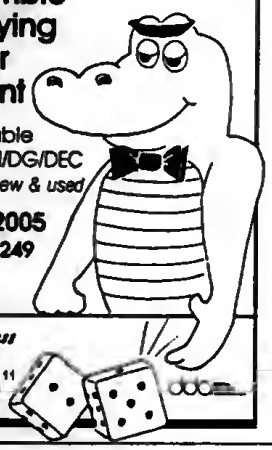

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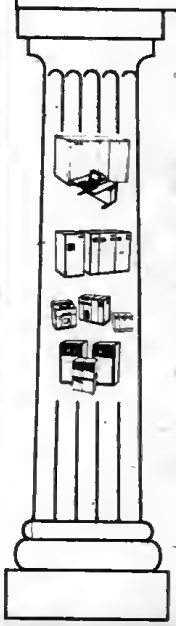

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9370-30	0.58	4 to 8
9370-40	0.75	8 to 8
4341-1	0.82	2 to 4
9370-60	0.98	8 to 16
9370-50	1.1	16 to 32
*3375-20	1.2	8 to 16
4381-11	1.4	4 to 16
4381-2	1.65	2 to 12
4341-2	1.8	2 to 16
4341-12	1.85	2 to 16
†4381-21	1.9	4 to 16
4381-1	2.1	4 to 16
*3377-20	2.5	4 to 16
4381-2	2.7	4 to 16
4381-12	2.7	4 to 32
†4381-22	3.2	16 to 32
4381-13	3.6	8 to 32
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4381-3	4.5	16 to 32
†4381-23	4.7	16 to 64

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4381-14	5.0	16 to 32
3083-JX	5.6	8 to 32
*3090-120E	7.3	16 to 128
†4381-24	7.5	16 to 64
3083JX	7.7	8 to 32
3090-150	8.0	32 to 64
3081D	10.0	16 to 32
*3090-180E	10.0	32 to 64
3083 GX	11.0	16 to 64
3081K	12.4	32 to 64
3081KX	13.5	16 to 64
*3090-150E	17.0	32 to 64
*3090-200E	27.7	64 to 128
3084QX	28.7	32 to 128
*3090-300E	31.0	64 to 128
*3090-400E	44.3	64 to 128
3090-400	50.0	128 to 256
*3090-400E	56.0	128 to 256
*3090-600E	76.0	128 to 256

* First Installation 1987
† First Installation 1st Qtr 1988

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5860	14.6	16 to 128
5867	22.0	24 to 128
5869	22.0	32 to 256
5870	24.6	32 to 128
5880	28.6	32 to 256
*5890-190E	32	64 to 256
*5890-200E	31	64 to 256
*5890-300E	40	64 to 256
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The above information is intended as a guideline for computer users on relative computer systems instruction cycle times. All data have been derived from published documentation and represent reasonable estimates of average MIPS ratings. However, Randolph is not responsible for the accuracy of the MIPS data. Cycle times will vary based on hardware software configurations and system manufacturers continually modify computer models as design improvements in hardware and software arise.

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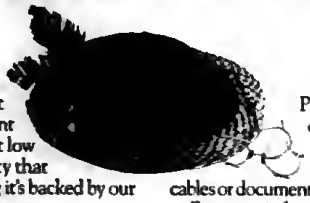

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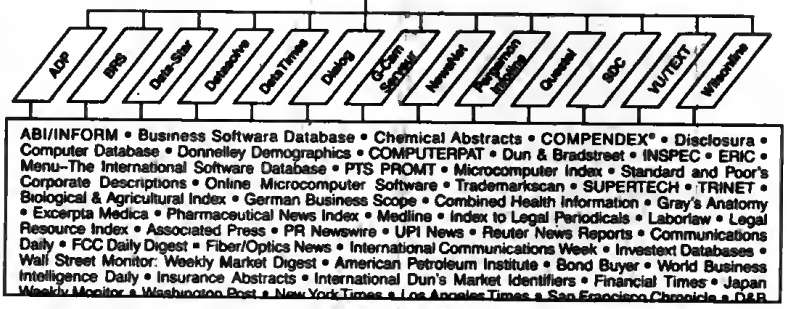

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Jan. 11	Terminals and Terminal Emulation Products	Dec. 24
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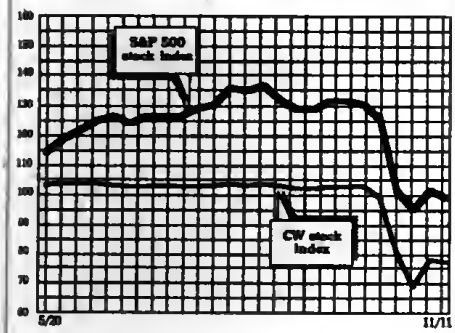

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Semiconductors	59.0	55.1
Peripherals & Subsystems	74.1	74.1
Leasing Companies	90.7	86.9
Composite Index	78.8	77.6
S&P 500 Index	102.1	99.2

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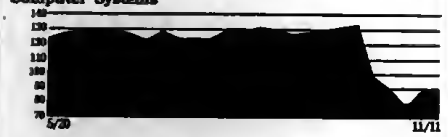

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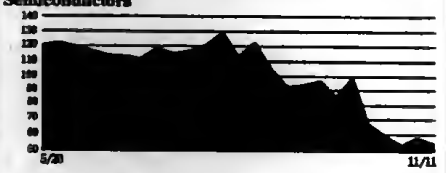

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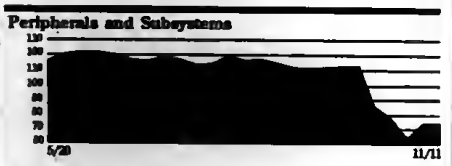

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EXCH	52-WEEK RANGE (1)		CLOSE NOV 11 1987	WEEK NET CHNGE	WEEK PCT CHNGE
Communications and Network Services					
N	AMERICAN INFO TECHS CORP	100	74	86.88	-1.38	-1.56
Q	ANDREW CORP	16	11	11.75	0.13	1.08
Q	ARTEL COMM CORP	5	2	2.13	0.60	30.77
N	AT&T	36	30	29.46	0.25	0.84
Q	AVANT GARDE COMP INC	6	2	2.38	-0.13	-5.00
Q	AVANTEK INC	16	7	6.38	-1.00	-10.67
N	AYDIN CORP	38	18	20.38	0.63	3.16
N	BELL ATLANTIC CORP	80	61	70.63	-2.25	-3.09
N	BELLSOUTH CORP	44	29	38.88	-0.75	-1.88
Q	FIBROCS INT	38	12	14.75	-1.00	-6.35
Q	COMPRESSION LABS INC	6	2	3.38	-0.50	-12.90
Q	COMPUTER NETWORK TECH	6	2	2.38	-0.18	-7.34
D	CONTEL CORP	40	25	26.50	0.00	0.00
D	DATA SWITCH CORP	6	4	5.25	0.50	10.53
Q	DIGITAL COMM ASSOC	48	20	24.75	1.75	7.61
Q	DYNATECH CORP	44	14	20.50	0.50	2.80
Q	EQUATORIAL COMM CO	5	2	3.18	0.13	4.08
Q	GANDALF TECHNOLOGIES	11	5	5.63	0.13	2.27
Q	GENERAL DATACOMM INDS	14	3	4.68	0.25	5.41
N	GTE CORP	45	29	35.63	-1.38	-3.72
Q	INFOTRON SYS CORP	12	5	5.50	0.00	0.00
N	ITT CORP	46	45	46.50	-0.88	-1.74
N	M A COM INC	16	7	10.38	0.25	2.47
Q	MCI COMMUNICATIONS CORP	12	5	10.25	0.88	9.33
Q	MICOM SYS INC	16	7	7.50	-0.38	-4.75
Q	NETWORK SYS CORP	16	7	8.88	0.50	5.97
N	NORTHERN TELECOM LTD	24	14	17.13	-0.38	-2.14
Q	NOVELL INC	30	12	18.88	0.38	2.03
N	NYNEX CORP	76	38	68.63	-2.50	-3.51
N	PACIFIC TELESIS GROUP	34	6	28.25	-1.25	-4.24
N	PARADYNE CORP	6	4	4.38	0.13	2.94
A	PENRIL CORP	6	1	1.75	-0.25	-12.50
N	PLESSEY PLC	41	24	26.00	1.75	7.22
N	SCIENTIFIC ATLANTA INC	30	6	11.00	-0.50	-4.35
N	SOUTHWESTERN BELL CORP	46	22	37.38	-0.75	-1.67
Q	3 COM CORP	26	12	16.00	0.50	2.86
N	TIMEPLEX INC	41	17	31.25	5.63	21.95
Q	UNGERMANN BASS INC	16	6	6.25	-0.50	-8.45
N	U S WEST INC	60	43	51.25	-0.13	-0.24
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Q	COMPUTER AUTOMATION INC	17	3	7.75	0.75	10.71
A	COMPUTER CONSOLES INC	12	2	3.00	-0.50	-14.29
Q	CONCURRENT COMP CORP	24	11	16.00	1.75	12.38
N	CONTROL DATA CORP DEL	38	16	22.63	-1.63	-6.70
Q	CONVERGENT TECH	12	3	3.31	-0.50	-13.11
Q	CONVEX COMPUTER CORP	22	6	8.38	0.38	4.48
N	CRAY RESH INC	138	47	71.25	0.25	0.35
Q	DAISY SYS CORP	13	5	6.88	0.50	7.84
N	DATA GEN CORP	39	16	20.63	-1.00	-4.62
N	DATAPOINT CORP	6	3	5.50	0.63	12.82
N	DIGITAL EQUIP CORP	200	97	134.50	2.63	1.99
N	FLOATING POINT SYS INC	17	4	4.13	0.13	3.13
N	GOULD INC	34	6	12.88	-0.60	-3.74
N	HARRIS CORP	43	24	26.00	-0.88	-3.26
N	HEWLETT PACKARD CO	74	36	51.75	3.75	7.81
N	HONEYWELL INC	91	49	56.93	-2.60	-4.23
N	IBM	175	100	122.25	1.63	1.38
Q	INFORMATION INTL INC	17	10	10.00	0.00	0.00
Q	IPL SYS INC	3	2	2.38	0.25	11.75
Q	MASS COMPUTER CORP	14	6	7.75	-0.28	-3.13
N	MITSUBISHI ELEC INDL LTD	146	93	157.13	10.63	7.25
Q	MEGADATA CORP	7	2	3.25	0.00	0.00
Q	MENTOR GRAPHICS CORP	38	14	18.50	2.63	15.56
N	NBI INC	14	4	5.13	-0.13	-2.38
N	NCR CORP	87	44	66.88	4.88	7.88
N	PRIME COMPUTER INC	31	12	16.38	-0.88	-5.36
Q	PYRAMID TECHNOLOGY	12	4	8.75	-0.50	-5.90
Q	STRATUS COMPUTER	41	15	21.00	-1.00	-4.55
Q	SUN MICROSYSTEM INC	46	14	34.13	0.50	1.88
Q	SYMBOLICS INC	6	1	1.63	-0.38	-18.75
N	TANDEM COMPUTERS INC	38	17	23.88	0.00	0.00
N	TANDY CORP	57	31	35.25	-4.75	-11.88
N	ULTIMATE CORP	37	16	23.38	0.63	2.75
N	UNISYS CORP	46	24	32.46	1.75	5.62
A	WANG LABS INC	16	10	11.38	-0.50	-4.21
Software & DP Services						
Q	ADVANCED COMP TECH	6	3	3.63	-0.25	-6.45
N	ADVANCED SYS INC	35	14	26.50	-0.25	-0.93
N	AGS COMPUTERS INC	30	11	14.63	-1.00	-6.40
Q	AMERICAN MGMT SYS INC	30	6	11.00	-1.00	-8.00
Q	AMERICAN SOFTWARE INC	22	6	8.63	0.25	2.99
Q	ANACOMP INC	11	3	8.38	0.13	2.38
Q	ANALYSTS INTL CORP	10	4	6.25	0.00	0.00
Q	ASHTON TATE	23	13	18.50	0.75	4.23
Q	ASK COMPUTER SYS INC	17	6	7.75	-1.00	-11.43
Q	AUTODESK INC	34	12	16.00	0.00	0.00
N	AUTO DATA PROCESSING	56	16	41.75	0.88	2.14
Q	BOOLE & BABBAGE INC	12	5	6.50	0.13	1.96
N	COMPUTER ASSOC INTL INC	37	13	25.88	0.38	1.47
Q	COMPUTER HORIZONS CORP	15	9	9.38	-0.13	-1.32
N	COMPUTER SCIENCES CORP	73	37	49.50	1.75	3.88
N	COMPUTER TASK GROUP INC	16	6	10.38	-0.13	-1.19
Q	COMSHARE INC	38	12	14.00	1.00	7.88
N	CULLINET SOFTWARE INC	14	5	6.25	-0.50	-7.41
Q	CYCARE SYS INC	10	6	6.38	0.25	4.08
Q	DUQUESNE SYS INC	33	10	14.80	-0.50	-3.33
Q	ENCATA INC	16	6	0.00	0.00	0.00
Q	GENERAL INTRS (CLS E)	51	24	35.75	-0.50	-1.38
Q	HOGAN SYS INC	17	5	6.13	-0.38	-5.77
Q	INFORMIX CORP	31	6	17.50	-1.50	-7.89
Q	INTELLICORP INC	11	3	3.79	-0.25	-6.25
Q	KEANE INC	10	5	5.75	-0.50	-8.00
Q	LOTUS DEV CORP	40	16	28.75	3.26	12.75
Q	MANAGEMENT SCI AMER	21	6	7.75	-0.75	-8.82
Q	MICRO PRO INTL CORP	8	2	4.63	0.31	7.23
N	MICROSOFT CORP	79	30	50.00	1.26	2.58
Q	NATIONAL DATA CORP	34	16	24.00	1.75	7.87
Q	ON LINE SOFTWARE INTL INC	22	6	10.75	0.00	0.00
N	ORACLE SYS CORP	38	8	23.00	-0.75	-3.16
N	PANSOPHIC SYS INC	28	11	12.80	-0.78	-5.89
Q	POLICY MGMT SYS CORP	30	16	18.80	-2.00	-9.75
Q	PROGRAMMING & SYS INC	14	6	8.25	0.00	0.00
Q	REYNOLDS & REYNOLDS CO	39	16	16.75	-3.75	-18.29
Q	SEI CORP	18	6	18.25	0.75	5.59
Q	SHARED MED SYS CORP	63	16	21.38	0.75	3.64
Q	SOFTWARE AG SYSTEMS INC	16	6	8.75	0.28	2.63
Q	SOFTWARE PUBG CORP	17	5	7.25	0.25	3.57
A	STERLING SOFTWARE INC	18	6	6.00	0.75	10.34
Q	SUNGARD DATA SYS INC	21	10	12.25	-0.75	-5.77
Q	SYSTEMATICS INC	30	17	25.00	3.26	14.94
N	SYS. SOFT INC.	24	7	11	1.25	12.50
N	URS CORP	23	11	12.00	-0.25	-2.04
Q	VM SOFTWARE INC	45	6	6.75	0.00	0.00
Semiconductors						
N	ADV MICRO DEVICES INC	25	10	10.75	-0.13	-1.16
N	ANALOG DEVICES INC	24	9	10.50	-0.13	-1.16
Q	ANALOGIC CORP	13	6	7.63	-0.38	-4.89
Q	INTEL CORP	42	13	24.88	-1.38	-5.24
Q	LSI LOGIC CORP	17	7	7.88	-0.50	-5.97
N	MOTOROLA INC	74	35	43.25	-1.25	-2.81
N	NATL SEMICONDUCTOR	23	10	12.50	-0.50	-3.85
N	TEXAS INSTRS INC	80	38	43.25	-6.50	-13.07
A	WESTERN DIGITAL CORP	23	12	13.63	-2.13	-13.49
Peripherals						
Q	ALLOY COMP	12.75	4.5	6.625	0.88	15.22
N	AM INTL INC	6	3	4.75	0.00	0.00
Q	AST RESH INC	23	6	8.13	-0.75	-8.45
Q	AUTO TROL TECH CORP	6	3	4.00	0.75	23.08
Q	BANCTEC INC	16	6	7.38	0.50	7.37
Q	CIPHER DATA PRODS INC	16	4	6.13	-0.63	-9.26
A	COGNITRONICS CORP	5	2	2.60	0.13	5.26
N	COMPUGRAPHIC CORP	28	16	22.00	-0.38	-1.68
N	COMPUTERVISION CORP	23	7	9.13	1.00	12.31
A	DATAPRODUCTS CORP	24	7	8.88	0.13	1.43
4	DATARAM CORP	6	6	6.25	-0.16	-2.92
N	DECISION INDS CORP	13	4	7.25	0.75	11.54
N	EASTMAN KODAK CO	71	42	49.25	-1.38	-2.72
Q	E M C CORP MASS	29	10	15.00	-0.25	-1.64
Q	EMULEX CORP	10	4	5.00	0.25	5.25
Q	EVANS & SUTHERLAND	46	16	19.25	-1.75	-8.33
Q	ICOT CORP	13	3	4.25	0.00	0.00
Q	INTERLEAF INC	24	9	14.88	-0.25	-1.65
Q	IOMEGA CORP	8	1	1.88	0.00	0.00
Q	LEE DATA CORP	10	3	3.38	0.25	8.00
Q	MASSTOR SYS CORP	6	1	1.46	-0.25	-12.90
Q	MAXTOR CORP	34	6	7.50	0.00	0.00
Q	MICROPOLIS CORP	44	13	19.75	-0.50	-2.47
Q	MINISCRIBE CORP	16	6	7.00	-1.25	-15.15
N	MINNESOTA MNG & MFG CO	84	45	60.60	0.38	0.62
4	MSI DATA CORP	24	11	15.00	1.00	7.14
Q	PRIAM CORP	6	1	1.75	0.00	0.00
Q	PRINTRONIX INC	13	6	8.88	0.38	4.41
N	QMS INC	27	12	13.38	-0.38	-2.73
Q	QUANTUM CORP	35	6	10.00	1.00	11.11
Q	RAMTEK CORP	6	2	2.75	0.38	15.75
N	RECOGNITION EQUIP INC	27	7	9.25	0.38	4.23
Q	REXON INC	14	5	5.38	-0.13	-2.27
Q	SCAN TRON CORP	17	7	10.00	0.00	0.00
Q	SEAGATE TECHNOLOGY	46	10	12.38	0.13	1.02
N	STORAGE TECH CORP	6	1	1.63	-0.13	-7.14
Q	TANDON CORP	7	2	2.38	0.00	0.00
A	TEC INC	7	3	3.75	-0.13	-3.23
N	TEKTRONIX INC	43	25	27.25	-4.00	-12.80
Q	TELEVIDEO SYS INC	3	1	1.63	-0.06	-3.73
N	TELEX CORP	102	30	49.75	-3.75	-7.01
Q	WYSE TECH	40	11	19.63	-1.38	-6.55
N	XEROX CORP	85	50	59.50	3.00	5.31
Q	XIDEX CORP	16	6	6.63	-0.75	-10.17
Leasing Companies						
Q	CAPITAL ASSOCIATES INTERNATIONAL INC	11	4	4.63	-0.37	-7.4
N	COMDISCO INC	37	12	17.38	-0.38	-2.11
N	CONTINENTAL INFO SYS	14	6	6.88	-0.38	5.17
Q	PHOENIX AMERN INC	6	3	3.00	-0.25	-7.86
Q	SELECTERM INC	6	4	3.81	-0.25	-6.15
N	U S LEASING INTL	88	42	67.63	0.00	0.00

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O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

Bouncing ball

Most tech stocks rise slightly at end of up-and-down week

In what is becoming a familiar bouncing-ball pattern since the Oct. 19 market drop, most computer stocks rebounded in last Thursday's rally to finish the week's first four trading days slightly ahead of where they began on Monday.

The most notable exceptions were stocks involved with acquisition offers. Timeplex, Inc. gained 4½ points to 31¼ on the strength of its proposed buy-out by Unisys Corp., which rose ¼ of a point to 32⅞. But Telex Corp. fell 7⅝ points to 49¾ as investors seemed skeptical about Asher Edelman's ability to finance his proposed $65-per-share takeover bid.

Among major vendors, IBM was up 2¾ to 122¼; Digital Equipment Corp. edged up ⅝ of a point to 134½; Hewlett-Packard Co. gained 1⅛ to 51¾; Compaq Computer Corp. jumped 2¾ to 55⅜; and Apple Computer, Inc. added 1 point to 38¾.

In the software field, Ashton-Tate Corp. and Lotus Development Corp. both rose 1⅛ points to 18⅛ and 28¾, respectively; Microsoft Corp. was up 2½ points to 50; and Computer Associates International, Inc. fell ¾ of a point to 25⅝.

CLINTON WILDER

1-2-3

FROM PAGE 1

- Support for IBM's Enhanced Graphics Adapter and Video Graphics Array graphics modes and more graph types and font capability.
- The ability to simultaneously display text and graphics.
- No copy protection.
- Compatibility with earlier versions of 1-2-3.
- Spreadsheet auditing and cell-annotation facilities.

Although the product is not due until the second quarter of 1988, Lotus began briefing key customers on the product several weeks ago. The new features and early demonstrations are viewed by some as a necessary response to the increasing number of solid choices among spreadsheets.

Lotus has already lost headway in at least two key accounts to Excel. Both Arthur Andersen & Co. and Manufacturers Hanover have announced they are moving away from 1-2-3 and into the arms of Excel.

Lotus's 1-2-3 has been almost completely rewritten from assembler to C for porting to other environments, including Apple Computer, Inc.'s Macintosh, IBM 370 mainframes and an expected move to Digital Equipment Corp.'s VAX and the Unix platform. However, a user who saw the product noted that it looks almost identical to the current release of 1-2-3 but is faster.

That is Lotus's plan, according to Peter Simon, general manager of Lotus's Business Products Division. "It is absolutely going to be easily used and understood and immediately productive for our millions of users," he said.

Key selling point

The ability to run under both MS-DOS and OS/2 may be a key selling point and was achieved by using the Family Applications Programming Interface (FAPI) approach to developing OS/2 applications. Because FAPI is used to create one set of source code for both environments, not all OS/2 capabilities — such as interapplications communications — are used. Release 3 will, however, address up to 16M bytes of random-access memory and work in a multitasking setup.

Release 3 incorporates some features that have been made popular by both competitive and add-on products. "The spreadsheet auditing and annotation abilities are things that, by other peoples' introductions, have become known as additional handholds that people like," Simon noted.

The key features are spreadsheet linking and multidimensional spreadsheet capability, according to Lotus and a user who has seen the product. With 3-D, "You can now have spreadsheets coming from any number of locations and have them separated but combinable within a Release 3 work space," Simon remarked. And with the linking capability, users can manipulate common data in separate work sheets simultaneously.

Spreadsheet capacity remains the same, but users can build large models by putting macros in a separate file and using the linking capability for macro execution, Simon explained.

LEAF is scheduled to debut along with Release 3. The language, similiar in structure to C, is positioned to provide "super macro capability," according to Lotus. LEAF will be available separately as a tool kit, but LEAF commands can be executed within Release 3.

Release 3 shows the dramatic difference in strategies between Lotus, which still advocates character-based interfaces able to run on Intel Corp. 8088-based systems, and its latest spreadsheet rival, Microsoft, which is pushing users to Intel 80286- and 80386-based systems.

Unlike Excel, Release is not a graphical user interface product, nor is it IBM System Applications Architecure-compatible. As a result, Release 3 does not require the same level of hardware that a product such as Excel does.

For those moving quickly to graphics-based products, Excel reportedly will ship soon. But for those willing to wait until late 1988 for the Presentation Manager applications, Lotus will battle Microsoft with 1-2-3/G, a graphics-based version of 1-2-3.

Lotus DBMS to combine tools, engine in one package

BY ED SCANNELL
CW STAFF

CAMBRIDGE, Mass. — A Lotus Development Corp. official said last week the firm's forthcoming multiuser data base management system will be broken into two parts, a front-end set of user tools and a back-end engine. The product will support a series of data base engines beginning with IBM's DB2.

In a speech here last week, Lotus's Chuck Digate said the company divided the product to provide users with a common interface to data regardless of whether it resides on a microcomputer, a mainframe or in a work group situation.

Lotus was able to divide the product, which Digate called an example of cooperative processing, because of its early adoption of IBM's SQL standard. The product, code-named Lotus/DBMS, works with IBM's OS/2 operating system and Presentation Manager and is not scheduled for delivery until late 1988.

Digate said Lotus designed Lotus/DBMS to work closely with 1-2-3/G, a version of the best-selling spreadsheet based on the Presentation Manager, although he emphasized that the two were also designed to be stand-alone products.

The reason for making the two products complementary was to give Lotus spreadsheets the ability to handle large-scale data base applications.

"For a long time, our customers have been telling us that they need more advanced data base functionality from within their spreadsheets," Digate said in his speech. "And while a spreadsheet is suitable for simple data base management, it's not always an appropriate foundation for large-scale applications."

Lotus is also working on a network application product that allows users to better manage shared information. Digate said the product takes into consideration the "ambiguous ways people work together" and addresses the problems associated with data integrity, validity and security.

The product, which he declined to identify by name or give delivery dates for, is being designed for a graphics environment and should help users in managing both textual and graphical information in groups.

AT&T bets on digital transmission

BY ALAN ALPER
CW STAFF

BEDMINSTER, N.J. — AT&T said last week it plans to invest a total of $6 billion during the next two years — $1 billion more than previously projected — to expand the digital transmission capabilities of its public global telecommunications network.

AT&T said it will spend $3 billion next year and the same amount in 1989 to almost double the number of digital miles, add more digital switches and install software to provide automatic rerouting of calls on its public network.

Improving the digital highway, AT&T said, will protect business customers' investments in their communications equipment, provide cheaper, faster and cleaner transmission of voice, data and video signals and pave the way for the adoption of advanced services that are available through Integrated Services Digital Network (ISDN).

'Customers want more'

"Business customers want more and more digital communications services, from basic transmission services to intelligence-based applications," said Frank Blount, president of AT&T's Network Operations Group, "and we're going to meet that growth in demand, which is running at nearly 20% each year."

Blount, however, said it will be another 18 months to two years before AT&T tariffs the primary rate interface for ISDN. AT&T, he said, wants to complete its ISDN trials and better determine customer requirements before it tariffs the primary rate interface.

Blount said the domestic portion of the public network will be expanded from 45,000 to 67,000 digital miles by 1990. In addition, the company expects to finish installing fiber-optic cable across both the Atlantic and Pacific Oceans next year, which, by 1991, will help increase AT&T's global digital network to more than 88,000 miles, almost doubling current capacity.

Moreover, the company intends to increase the number of fiber-optic lines operating at 1.7G bit/sec. during the next few years. A fiber-optic system operating at 1.7G bits was recently finished between Philadelphia and Chicago, and more are expected during the next few years to connect most major cities, Blount said.

Adding switches

AT&T, which has installed 126 4ESS and 5ESS digital switches across its public network, expects to add another 25 during the next two years, Blount said. Next year, the firm will install restoration switches to divert digital services to alternate routes during outage situations, he added.

The company recently completed the installation of a computer-based system to dynamically route calls around possible congestion areas on the network, which has resulted in an unspecified cost savings for the company, Blount said.

Software to automatically reroute digital services will be added to those switches by the end of the decade, he projected.

Lotus will salve 1-2-3 upgrade burn

BY DOUGLAS BARNEY
CW STAFF

CAMBRIDGE, Mass. — Lotus Development Corp. officials promise that next year's upgrade to Release 3 of 1-2-3 will not be the logistical nightmare for users that the last upgrade was. The process will be streamlined with the use of electronic distribution and increased dealer participation.

Users of 1-2-3 Release 2 will be able to upgrade to the $495 Release 3 for $150 when the product is available in the second quarter, while 1-2-3 Release 1A users can upgrade for $200, Lotus said.

Lotus has also promised that despite a new file structure, 1-2-3 Release 3 should be entirely compatible with models, macros and add-ons created for earlier versions of 1-2-3. The product can also reportedly read and write 1-2-3 Release 1A and Release 2 files.

Upgrade path still bumpy

Because of product incompatibilities and upgrade availability limited largely to Lotus itself, the last 1-2-3 upgrade put a tremendous burden on users. The firm now claims to have learned its lesson but is still expecting some user hardship as a result of a growing base of users.

"The upgrading logistics will be significantly greater than the last time around," said Peter Simon, general manager of Lotus's Business Products Division.

The firm will ship a Preview Kit prior to the delivery of Release 3 that provides technical information as well as a copy of the product for users to do compatibility testing.

"People can run macros to ensure compatibility prior to the release of the product," Simon explained.

Some large corporations that have been testing Lotus Electronic Distribution of Software (LEDS) can distribute upgrades directly from an IBM 370 host computer.

"We are intending that LEDS will provide the upgrade for those people that have leads at the time of Release 3," Simon said.

LEDS, announced earlier this year, is a system that allows shops with 370-type host computers to download software directly to end users.

Because Release 3 runs under Microsoft Corp.'s MS-DOS as well as OS/2, users can move from Release 3 under MS-DOS to OS/2 without upgrading the application.

IBM maps out telecom plans

High-level interface, 16M-, 100M-bit Token-Ring cards lead strategy

BY ELISABETH HORWITT and PATRICIA KEEFE
CW STAFF

CAMBRIDGE, Mass. — IBM last week raised the shade on a two-year window, giving analysts a peek at telecommunications development plans and products slated for introduction by 1990.

IBM briefed analysts on a high-level interface said to ease the burden on programmers who want to distribute applications across different IBM communications environments, according to consultant Frank Drubeck, president of Washington, D.C.-based Communications Network Architects, Inc.

Common Programming Interface for Communications (CPIC), a product IBM is said to have quietly announced two weeks ago, is the first IBM offering that "provides some transparent distribution of services," particularly in an LU6.2 peer-to-peer network, Drubeck said.

Included in the offering are a set of simple programming commands and a directory service that will automatically route a command or query to another IBM system if it fails to find the resource locally, he said. CPIC allows the user to "issue SQL commands into the blue and get an answer" or access IBM's Transparent Services Access Facility through LU6.2.

IBM representatives reportedly confirmed rumors of a communications controller set for introduction early next year. No details were provided, but consultants drew conclusions from separate talks with IBM.

"When the 3720 came out, IBM indicated to me that they wanted to add muscle to their communications controllers to match the Token-Ring's speed," said David Terrie, president of Scituate, Mass.-based Newport Consulting. He said a second, lower cost model designed for IBM's low-end 9370s was also a strong possibility.

Ellen Hancock, president of IBM's Communication Products Division, reportedly denied recent reports that IBM plans to merge its 9751 private branch exchange architecture and its 3725 front-end processor.

The seminar was particularly revealing about IBM's local-area network (LAN) strategies. IBM announced plans for 16M-bit and 100M-bit Token-Ring cards as well as a Fiber Distributed Data Interface-compatible adapter for a 100M-bit fiber-optic Token-Ring. Analysts expect IBM to offer the 16M-bit card next year and the 100M-bit card in 1989.

Leo Esposito, systems manager of LANs for IBM's Communication Products Division, said IBM has not decided whether to develop the 16M-bit card for just the PS/2 family, said Thomas White, president of Santa Clara, Calif.-based Infonetics, Inc.

Hancock told analysts she expects IBM to resolve the shortage of PS/2 Token-Ring cards by the first half of 1988.

Although IBM has no available diskless workstation, a speaker in one session hinted at diskless PC support in the recently announced upgrade to IBM's network software, PC LAN Program 1.3, said John McCarthy, director of research for Cambridge, Mass.-based Forrester Research, Inc.

An IBM speaker also hinted at plans for an Advanced Peer-to-Peer Networking (APPN)-like implementation on the PC LAN Program. "It will let the user have a department of small networks acting as peers without a host system, as in a 370 host," said Clare Fleig of the International Technology Group in Los Altos, Calif.

Also previewed was IEEE 802.4 support for the PC Network Broadband, which will enable IBM's PC LAN Program to run with the Manufacturing Automation Protocol.

IBM poised to make Rolm a formal corporate division

Private branch exchange vendor Rolm Corp. will shortly lose its status as a subsidiary of IBM and will be folded in as a division of the computer giant, IBM spokesmen confirmed during a recent analysts' meeting in Cambridge, Mass.

Fred Chanowski, president of Needham Heights, Mass., consulting firm Telecommunications Management Corp. said that IBM Group Vice-President of Telecommunications John Blumenstein "told me that Rolm will be a fully integrated IBM division, not a department under the Communication Products Division."

IBM sources confirmed the upcoming reorganization. Rolm was "already a division in practice; it's just a matter of making it so in name," one source said.

Rolm will be "stripped down to a research, development and manufacturing company" while service, sales and support and other aspects of the business will be shifted to various IBM divisions reporting to Blumenstein, Chanowski stated. IBM gave no time frame for Rolm's conversion.

IBM is currently in the process of merging Rolm's parts and installation and service divisions into its own National Service Division, according to L. Scott Perry, IBM's director of telecommunications systems marketing. "Most voice systems will be serviced as before," except that Rolm service representatives will now have access to IBM technology and information systems support for their work, Perry said.

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INSIDE LINES

Why take chances? Last week DEC quietly imposed a "period of selective hiring," according to a company spokesman. Although not instituting a companywide hiring freeze, DEC will only hire in revenue-generating areas such as sales and service and engineering. Any other hiring must be done on an "exception" basis. At DEC's annual meeting two weeks ago, Chairman Ken Olsen noted that the company hadn't noticed any change in customer's orders despite the stock market crash but was considering internal measures as a precautionary measure. Another of those measures will be a cutback on certain nonessential projects and a careful scrutiny of all discretionary spending.

Rewriting history. DEC and the MAP/TOP User Group have apparently laid down their arms in the debate over whether Ethernet or MAP is a superior factory-floor communications network. William Witmore, DEC's vice-president for basic industries marketing, said last week that Ken Olsen's remarks about MAP had been misunderstood by the press and the public. Of course, he said, DEC will support MAP 3.0 when it comes out in June 1988. An olive branch was also extended separately by MAP User Group Chairman James Doar of Boeing Computer Services. "DEC, understandably, would like to continue to sell Decnet and Ethernet in factories," Doar said. "But they are with us in supporting and demonstrating MAP. There is no disagreement."

Blame it on Rio. The Reagan administration plans to slap trade sanctions on Brazil for its *informatics* policy, which keeps U.S. computer products out of the country to protect Brazil's domestic computer industry. The U.S. retaliation will include a ban on computer imports from Brazil, which amount to only $21 million, and $105 million worth of trade sanctions against other Brazilian products.

Now you see it, now you don't . . . The code for the Presentation Manager — the OS/2 graphics user interface component — including key corporations, was supposed to go out to developers next month. Now comes word that this code won't show until January, giving a broader opportunity for character-based OS/2 applications to steal some graphics user interface thunder.

. . . and the last shall be first. During the Seybold Executive Forum in Boston last week, Microsoft Chairman Bill Gates' slide presentation (can we say that?) on MS OS/2 ship dates indicated that Microsoft will be shipping the MS OS/2 LAN Manager to OEMs in first-quarter '88.

Acronymworld. Excelan, one of the players in the Transmission Control Protocol/Internet Protocol (TCP/IP) market, is expected to announce this week that it is providing TCP/IP support for Microsoft's OS/2 LAN Manager.

Left out in the cold? Unisys's proposed acquisition of Timeplex poses some interesting questions for both companies' relationships with other computer and communications vendors. Unisys recently signed an agreement with Paradyne to jointly develop and incorporate modems, multiplexers and a network management system into its product line. Unisys emphasized last week that it would develop a network management system with Timeplex once its acquisition of the Woodcliff Lake, N.J., firm was completed and would begin discussions with Paradyne this week on how to restructure its agreement with that company. Meanwhile, Timeplex is using Hewlett-Packard's HP 9000 minicomputer as the traffic cop for its Timeview network management system. The company said last week that it will continue to use the HP system as its hardware platform but left open the possibility that since Timeview was written in C, it could be ported to another system, including one made by Unisys.

Skeleton in the closet. Look for Apple to release a base version of its Unix implementation, AU/X, by the first quarter of 1988. Apple, if you'll recall, has spent the better part of the year fiddling with AU/X, which was codeveloped with Unisoft. According to a source, Apple is anxious to get a version — any version — out the door, so users will have to wait to get all the bells and whistles.

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